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This Week

To meet production demands schedules during the last few months at the Buick plant have been stepped up considerably beyond their original figures. Joseph Geschelin paid them a visit to see just how it was handled and found a production line with a number of features of more than usual interest. On page 790 you will find the How's and Why's together with a lot of Pictures.

There has been a great time at the S. A. E. Summer Meeting. The candid camera has been right on the job so just turn to page 785.

Retail Sales Peak Broadens

Prolonged Demand Holds June Schedules Within Nine Per Cent of May Output

By Harold E. Gronseth

Reflecting the strength of the retail market, motor vehicle production will be maintained at a high level throughout June. Less than 10 per cent decline from the May output is indicated by schedules on which plants are now working. Twelve of the leading producers who account for 90 per cent of the industry's total have set schedules for the current month which call for the building of just nine per cent fewer vehicles than in May. Their programs, of course, are subject to revision if retail sales vary substantially.

Companies which had completed the compilation of delivery figures for the last week or ten days of May were pleasantly surprised to find how well consumer demand had held up during the month. Several who thought they had seen the seasonal peak in April or early May found retail sales steadily rising throughout the month. One of the largest companies missed the year's peak in the final week of May by only 100 cars, despite the holiday interruption, which was practically equivalent to the loss of one day from the week.

While there was some curtailment in production toward the end of May, most companies went through with their original schedules, so that the month's total is not likely to fall much below the half-million mark earlier estimated. The indicated drop from April to May was well under 10 per cent, or not much different from the anticipated decline from May to June. A year ago the industry's May output fell 20 per cent below that of the peak month of April and June brought a further decline of approximately 2.5 per cent.

Unless retail demand continues substantially in excess of expectations, July's operations will be on a materially lower level, since the industry then will be within only a month or two of its changeover period. Most companies expect to operate well into August and some will be turning out current models during part of September, but that month undoubtedly will mark the low point of 1936 production, as it did last year.

(Turn to page 789, please)

Safety Is First at SAE Meeting

"Unless Highway Travel Is Made Safer, the Automobile Will Lose to the Railroads," Says Hoffman

By Herbert Hosking

Extension of drivers' licensing laws to all states and "glorification" of the operators' license to the degree that it became literally a passport for the operation of vehicles on the highway were immediate objectives listed by Paul G. Hoffman, president of Studebaker and chairman of the Street Traffic Committee of the Automobile Manufacturers Association, in an address to the Summer Meeting of the S.A.E., which ended Friday, June 5, and was attended by an unusually large number of policy-forming executives of the automobile industry. The total attendance came within a few persons of equalling last year's high figure of 610.

The Safety Session at which Mr. Hoffman spoke was the high point in a summer meeting dedicated to "engineering for safety and economy in automotive transportation." From the first session of the meeting in which Walter T. Fishleigh, consulting engineer, warned that "the control and general operation of the public's cars must be changed slowly and carefully"

and that "radical changes in control of this year's model from last year's is disconcerting—if not to say dangerous," speakers turned again and again to the accomplishments and possibilities of the motor vehicle as a medium of safe transportation.

Thirty-eight papers were presented and two sessions were given over to open forums with many speakers presenting their views. In a session presided over by K. T. Keller of Chrysler, with Mr. Hoffman and Henry M. Crane as co-chairmen, the discussion was unreported. A contest to determine driving skill, arranged by W. S. James, research engineer of Studebaker, as chairman, gave an opportunity for 100 members and guests of the S.A.E. to compare scores on parking, driving between obstacles, smooth starting and breaking, etc., with everyone driving the same type of car.

Nearly everyone present at the meeting was tested on the driver-reaction instruments developed under the direction of Dr. H. R. DeSilva of

(Turn to page 784, please)

S. A. E. Summer Meeting

Some digests of papers presented at the S. A. E. Summer Meeting appeared in the May 30 issue of **AUTOMOTIVE INDUSTRIES**. Other digests and complete papers will appear in the issue of June 13 and subsequently.

More GM Buildings

Big Laboratory Addition Under Way; Other Companies Expand

Construction of an 11-story addition to the General Motors research laboratories costing \$1,000,000 has been started in Detroit.

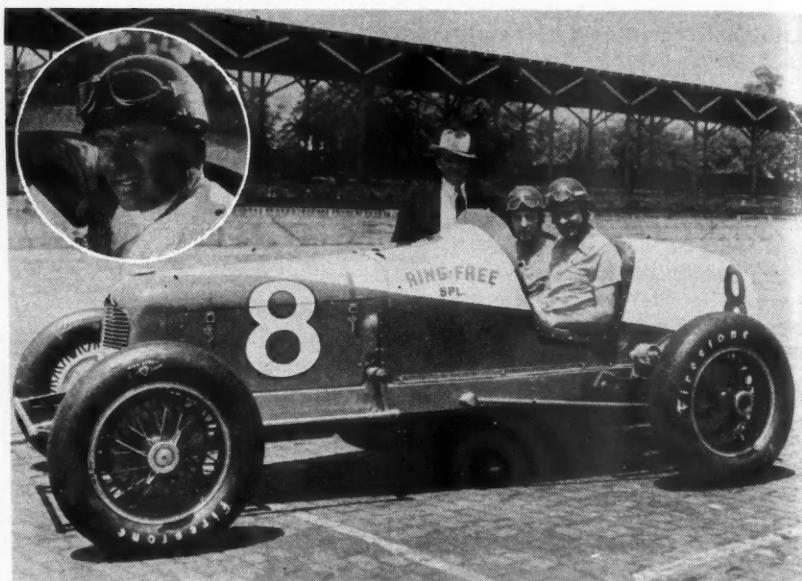
The addition will adjoin the present 11-story structure on the east, extending 180 ft. along the south side of Milwaukee Avenue and provides approximately 300,000 sq. ft. of floor space, including a basement floor. In appearance it will match the present research laboratories building of steel and concrete construction, with brick and stone facing.

The first seven floors of the structure will be occupied by the Fisher Body engineering and tool design divisions, providing more space for expansion of the Chevrolet engineering department in quarters vacated by the Fisher operations. The four top floors will be occupied by the art and color section of General Motors, now located in the General Motors Building.

Installation of machinery for a new axle plant, which comprises the major item in a \$6,000,000 expansion program now under way at the Pontiac Motor Co. here, was announced today by H. J. Klingler, president and general manager.

When the new axle plant gets into operation it will add 850 men to payrolls already close to an all-time high at Pontiac, Mr. Klingler stated. The new development is expected to get into operation in a few months, according to the *Pontiac Chieftain*, at which time all axles for Pontiac cars will be built there, as well as a part of the requirements for another General Motors division.

Mr. Klingler also announced that the company's foundry, re-opened in January after a four-year shutdown, was again operating full blast with the addition a week ago of the pouring of metal for six-cylinder motor blocks to other foundry activities started earlier, (Turn to page 816, please)



Meyer's Third Victory

New Record Set at Indianapolis 500-Mile Race; Few Mechanical Failures

By Bill Toboldt

With Louie Meyer winning the 24th annual Indianapolis race, his third Indianapolis victory, setting a new track record of 109.069 m.p.h., and the first five cars to finish also exceeding last year's mark of 106.240 m.p.h., the 500-mile grind set a new high mark in mechanical attainment, which was not marred by any fatal accidents. Meyer won the 500 in 1928 and 1933.

The high speeds were a direct reflection of the mechanical ability of the mechanics and drivers. The fuel limitation of 37½ gal. for the 500 miles necessitated such careful testing before the race that engine failures were reduced. At the end of the race Louie Meyer had approximately 4½ gal. of fuel left, having averaged better than 15 mi. per gal. Which illustrates what can be done by careful preparation.

There were six cars that ran out of fuel. In addition, a number of cars experienced trouble with hot and cracked manifolds. It is interesting to note that in order to get such good fuel economy compression ratios of approximately 15 to 1 were resorted to. In other words, the engines were practically operating as ignition Diesels. One driver described the fuel as "kerosene plus some gasoline and ethyl."

As a result of the high combustion chamber temperatures, special plugs were, of course, necessary. The first ten cars to finish were fitted with Champion spark plugs. These plugs were of a new racing design known as the MR-5 and consisted of a central electrode of copper. This is embedded in silimanite and the cement is protected from the (Turn to page 815, please)

How They Finished at Indianapolis

Finish Position	Driver	Number of Car	Car	M.P.H.	Cause of Withdrawal	Number of Pit Stops	Withdrawn in Lap No.	Finish Position	Driver	Number of Car	Car	M.P.H.	Cause of Withdrawal	Number of Pit Stops	Withdrawn in Lap No.
1	Louis Meyer	8	Ring Free Special	109.069		2		6	Gardner Special	6	Gardner Special		Slipping clutch	2	70
2	Ted Horn	22	Harta Special	108.190		2		7	Hamilton Harris Sp.	7	Hamilton Harris Sp.		Ran out of gas	2	193
3	Doc MacKenzie	10	Gilmore Special	107.460		2		12	Boyle Products Spec.	12	Boyle Products Spec.		Broken axle	1	118
4	Mauri Roe	36	F W D Special	107.272		2		14	Elgin Piston Pin Sp.	14	Elgin Piston Pin Sp.		Ran out of gas	7	179
5	Chet Miller	18	Boyle Products Spec.	106.909		2		15	Lits Special	15	Lits Special		Ignition trouble	7	170
6	Ray Pixley	41	Fink Auto Special	105.253		2		21	Pirring Special	21	Pirring Special		Bkn clutch shaft	4	88
7	Wilbur Shaw	3	Gilmore Special	104.233		4		27	Wheeler Special	27	Wheeler Special		Bkn motor sup.	1	43
8	Geo. Barringer	17	Kennedy Tank Spec.	102.630		3		28	Sampson Radio Spec.	28	Sampson Radio Spec.		Ran out of gas	2	187
9	Zeke Meyer	53	Boyle Products Spec.	101.331		2		33	Gilmore Special	33	Gilmore Special		Ran out of gas	5	195
10	G. Connor	38	Marks Miller Special	98.931		2		42	Bowes Seal Fast Sp.	42	Bowes Seal Fast Sp.		Loose motor sup.	4	115
	R. Hepburn	9	Art Rose Special		Run. at finish	5		43	Belanger Miller Sp.	43	Belanger Miller Sp.		Leaking oil	1	20
	Emil Andres	19	Carew Special		Run. at finish	7		44	Bowes Seal Fast Sp.	44	Bowes Seal Fast Sp.		Broken trans.	1	36
	Lou Moore	32	Burd Piston Ring Sp.		Run. at finish	5		46	Burd Piston Ring Sp.	46	Burd Piston Ring Sp.		Broken piston	1	4
	Fred Winnai	35	Red Lion Special		Run. at finish	3		47	Sullivan & O'Brien Sp.	47	Sullivan & O'Brien Sp.		Bkn clutch stud	1	13
	W. Cummings	2	Boyle Products Spec.		Broken Clutch		0	52	Abels Auto Special	52	Abels Auto Special		Bkn crankshaft	1	50
	F. Roberts	4	Burd Piston Ring Sp.		Ran out of gas	3	181		D. Williams	54	Superior Trailer		Ran out of gas	4	191
	W. Winn	5	Harry Miller Special		Broken rod	2	71								

SAE Aircraft Production Meeting

Will Be Held in Los Angeles in October, with Cooperation of Aviation Groups and Coast Sections

The first technical meeting on production problems ever held by the aircraft industry will take place next October in Los Angeles, Cal., under the sponsorship of the Society of Automotive Engineers, John A. C. Warner, secretary and general manager, announced today.

Carleton E. Stryker, chief engineer, Curtiss-Wright Technical Institute of Aeronautics, Glendale, Cal., has been appointed general chairman of the three-day meeting, plans for which have been made under the auspices of the society, of which Mac Short, Stearman Aircraft Co., is vice-president representing aircraft engine interest, and Opie Chenoweth, U. S. Army Air Corps, is vice-president representing aircraft engine activities.

The American aircraft industry's most important figures are members of the advisory committee, which includes Dr. C. G. Abbot, secretary, Smithsonian Institution, Washington; Dr. Lyman J. Briggs, director, National Bureau of Standards, Washington; Donald L. Brown, president, United Aircraft Corp., East Hartford; Brig. Gen. H. B. Clagett, commanding officer, March Field, Riverside; Donald W. Douglas, president, Douglas Aircraft Co., Santa Monica; Jack Frye, president, Transcontinental & Western Air Inc., Kansas City; L. D. Gardner, secretary, Institute of the Aeronautical Sciences, New York; Dr. W. R. Gregg, chief of Weather Bureau, United States Department of Agriculture, Washington; Col. E. S. Gorrell, president, Air Transport Association of America, Chicago; Hon. H. F. Guggenheim, New York; C. F. Horner, president, National Aeronautic Association, Washington; W. Wallace Kellett, president, Kellett Autogiro Corp., Philadelphia; J. H. Kindelberger, president, North American Aviation, Inc., Inglewood; Rear Admiral E. J. King, United States Navy, Washington; Dr. George W.

Lewis, director of aeronautical research, National Advisory Committee for Aeronautics, Washington; P. W. Litchfield, president, Goodyear Tire & Rubber Co., Akron; Glenn L. Martin, president, The Glenn L. Martin Co., Baltimore; Major C. C. Moseley, manager, Grand Central Air Terminal, Glendale; W. A. Patterson, president, United Air Lines Transport Corp., Chicago; Robert Porter, president, Kinner Airplane & Motor Corp., Ltd., Glendale; Brig. Gen. A. W. Robins, chief of division, U. S. Army Air Corps, Dayton; L. W. Rogers, president, Aeronautical Chamber of Commerce, Washington; C. R. Smith, president, American Airlines, Inc., Chicago; Dr. Robert G. Sproul, president, University of California, Berkeley; William B. Stout, president, Stout Engineering Laboratories, Inc., Dearborn; Juan T. Trippe, president, Pan-American Airways, Inc., New York; Hon. Eugene L. Vidal, director of air commerce, United States Department of Commerce, Washington; Hon. Edward P. Warner, New York; and Maj. Gen. Oscar Westover, chief of the Air Corps, War Department, Washington.

Plans for the meeting were laid re-
(Turn to page 816, please)

British Car Sales in March Broke All Previous Records

New vehicle registrations in Great Britain amounted to 34,935 in March this year, the highest monthly figure reached in the history of the British automotive industry, according to *The Motor Trader*. Comparative figures for the month were:

	March, 1936	March, 1935
Passenger Cars	34,935	32,950
Hackneys	887	724
Trucks	8,446	7,280



Al Laansma

Laansma Named Editor of Motor World Wholesale

Al Laansma has been appointed editor of *Motor World Wholesale*, replacing Leon F. Banigan. Mr. Laansma had been managing editor of the publication since last November.

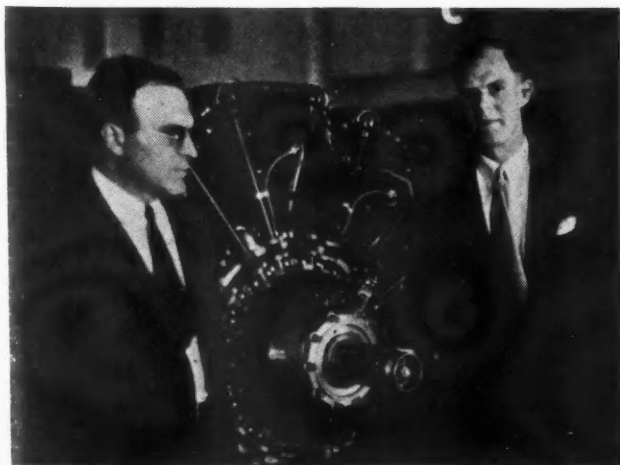
Mr. Laansma's first job was with an automotive wholesaler in Grand Rapids, Mich. After graduation from the University of Michigan, he took up newspaper work, holding repertorial and editorial positions with the *Flint Daily Journal* and the *Detroit News*.

In 1930, he was made director of publicity for the Motor and Equipment Association, then composed of both jobbers and manufacturers. He remained with the Motor and Equipment Manufacturers Association after the reorganization of the M. E. A. in 1932 and, besides being director of publicity, was also secretary of the Shop Equipment Associates and organized jobber attendance promotion at the Automotive Service Industries shows and National automobile shows. He has countless friends among jobbers and manufacturers, knows jobber problems and has their viewpoint.

Fiat to Assemble Cars in Netherlands India

The Italian automobile manufacturing company, Fiat, is planning the erection of an assembly plant for Fiat cars in Batavia, Java, according to a report from Trade Commissioner Donald W. Smith to the Department of Commerce.

Fiat cars sold in Netherlands India during 1935 numbered 289 units, which were approximately 8 per cent of the 3764 cars sold in that market. Fiat cars were, however, the fifth most popular models, it is pointed out. Sales of Fiats are confined chiefly to Java.



Ralph R. Tee-tor (left), president of the S.A.E. and in charge of engineering, Perfect Circle Co., and C. E. Stryker, chief engineer Curtiss-Wright Technical Institute of Aeronautics, who will be chairman of the S. A. E. aircraft production meeting in Los Angeles, Oct. 14-16.

(Continued from page 781)

Safety Is First

the Harvard Bureau of Street Traffic Research, who presented a paper on "Research on Driving Skill."

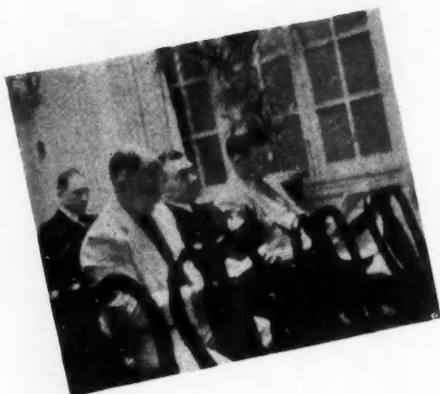
Mr. Hoffman's address took issue with some points of view with respect to engineering responsibility for vehicle safety.

"Insofar as possible," he said, "our cars must be built further fool-proof from a safety standpoint, with mechanical compensations for human weaknesses wherever it is possible to provide them."

Calling highway safety the "new dynamic" in automotive engineering, he expressed the view that "unless highway travel is made safer and con-

gestion is reduced, the private automobile will lose ground to the railroads and other competing forms of land transport."

Divided two-lane highways have been found to be almost accident-proof, he stated, and it rests with the automobile industry to support organizations which seek to apply available construction money. Gadgets and nostrums can never replace sound driver education as an answer to the reduction of motor-vehicle accidents, Mr. Hoffman pointed out. The A. M. A. is supporting various organizations which have shown ability to deal ade-



(Above) F. K. Glynn leans forward to catch a point. Next to him are Harley W. Drake, S.A.E. vice-president representing Transportation and Maintenance Engineering, and George T. Hook, editor, *Commercial Car Journal*, who read a paper earlier in the session.

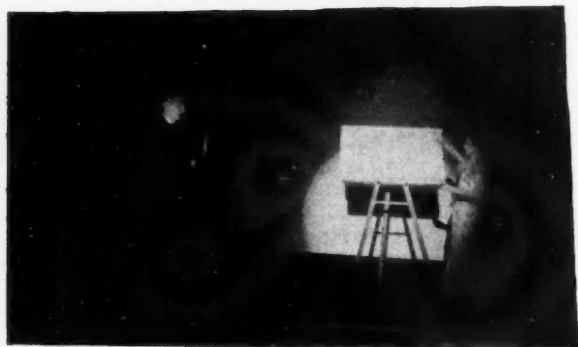


(Above) Karl Johnson and Ben Hopkins of the Cleveland Graphite Bronze Co.

(Center) H. R. DeSilva, Bureau of Street Traffic Research, Harvard University, sits down between bouts with assembling driver-reaction tester demonstrated in connection with his paper.



(Lower left) Mr. and Mrs. Murray Fahnestock diverted the "Car of the Future" session with their own highly original ideas on the subject. He is technical editor of the *Ford Dealer and Service Field*.



(Upper center) Robert N. Janeway, research engineer, Chrysler Corp.

(Below) Laurence P. Saunders, director of engineering, Harrison Radiator Corp.



(Lower right) Henry M. Crane (right), technical adviser to the president of General Motors and a past president of the S.A.E., talks with Dr. Edward C. Newcomb, pioneer designer in automotive engineering.



at SAE Meeting

quately with industrial safety, hoping to spread through them the same technique which was used in cleaning up the industrial accident situation.

Sporadic safety campaigns and horror campaigns are ineffective in driver education, according to Mr. Hoffman, who emphasized the importance of consistent effort in educating 40,000,000 drivers to 100 per cent observance of safe driving rules.

Returning to the engineering side of the problem, he pointed out the importance of standardization in producing safe motor vehicles. "Much of the progress which has been made in the

past in building safety into our motor vehicles has come about as a result of the past standardization program undertaken by the S.A.E.," he said. But, he added, "with compulsory inspection of motor vehicles in many of our important states today, and with the movement spreading, it is extremely important that standardization work be carried on."

"At the moment, motor vehicle administrators are very critical of the wide variety of mechanisms for adjusting headlamps and brakes. Unless the engineers themselves come into agreement on this class of adjustment which will be handled by inspection stations, the legislators will start making laws next winter."

(Upper center) Lowell M. Brown, Jaray Corp. of America, read some notes bearing on Walter Fishleigh's "Car of the Future" paper at the first session.



(Below) W. E. England, chief engineer, Ohio Rubber Co.



(Lower left) J. D. Pearson and T. P. deParavienni of Rolls-Royce (England) were interested auditors at several sessions.



(Lower center) Vincent Bendix (center) with Victor Kliesrath (right) and V. R. Heftler, president of Zenith Carburetor, in the lobby of the Greenbrier.

(Lower right) Morrill C. Horine, sales promotion manager, Mack Trucks, Inc.



(Above) L. R. Buckendale, executive engineer, Timken-Detroit Axle, golfs with Karl M. Wise, technical adviser at Bendix.



(Above) Lights go out—slides come on—here's how it looks. Prof. H. M. Jacklin of Purdue is explaining slide of a nomograph correlating analysis of more than 6000 observations of the effect of horizontal and vertical motion on the comfort of seat-bound passengers.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

Business continued the upward movement last week; and, according to one index, activity reached a new high for the current movement. There are some who expect that trade in June will surpass that in May, thus reversing the usual seasonal trend. Retail sales for the country as a whole were reported to be from 10 to 15 per cent above those in the corresponding period last year. The drought continued in the eastern half of the cotton belt, and growers are becoming concerned about their crops. In the western and southwestern part of the cotton belt rains have been excessive and not entirely favorable for the crops.

Carloadings Continue to Gain

Railway freight loadings during the week ended May 23 totaled 683,406 cars, which marks an increase of 1959 cars above those in the preceding week, a rise of 85,010 cars above those a year ago, and a gain of 57,416 cars above those two years ago.

Food Prices Slightly Higher

Retail food costs during the two weeks ended May 5 increased 0.4 per cent, according to the Bureau of Labor Statistics. The rise was mostly due to higher prices for meat, vegetables, and eggs. The current index stands at 80.1, based on the 1923-25

average as 100, as against 78.9 a month earlier and 81.5 a year earlier.

Power Production 15% Over Year Ago

Production of electricity by the electric light and power industry in the United States during the week ended May 23 was moderately below that for the preceding week but 15.3 per cent above that in the corresponding period last year.

Crude Output Steady

Average daily crude oil production for the week ended May 23 amounted to 3,007,150 bbl., as compared with 3,008,050 bbl. for the preceding week and 2,605,300 bbl. for a year ago.

Fisher's Index

Professor Fisher's index of wholesale commodity prices during the week ended May 30 stood at 81.2, as against 80.5 the week before and 81.0 two weeks before. The rise is the first in several weeks.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended May 27 showed a decline of \$1,000,000 in holdings of bills bought in the open market. Holdings of discounted bills and government securities remained unchanged. Money in circulation increased \$6,000,000, and the monetary gold stock rose \$13,000,000.

New Car Retail Financing 61% Higher than Year Ago

The dollar volume of retail financing of new passenger automobiles shows an increase of 61 per cent for the month of April as compared with April, 1935, and an increase of 90 per cent compared with April, 1934, according to preliminary estimates by the Department of Commerce. As compared with March, 1936, there was an increase of 24 per cent.

The aggregate volume for the first four months of this year was 49 per cent above the first four months of 1935 and 107 per cent higher than for the corresponding period of 1934.

These estimates on automobile financing are based upon figures reported to the Bureau of the Census by a sample group of large finance companies that have been in continuous operation since 1929. The dollar volume of these organizations represents over three-fourths of the auto-

mobile finance business written by all finance companies reporting to the Bureau of the Census.

Five-Year \$250,000 Safety Plan Launched by C. I. T.

Establishment of the C. I. T. Safety Foundation to further the cause of highway safety was announced last week by Arthur O. Dietz, president of C. I. T. Corp., one of the subsidiaries of Commercial Investment Trust, Inc., New York. The Foundation will have available for its work over a five-year period a fund of \$250,000, of which \$50,000 has been advanced to the trustees of the foundation for the first year's activity, with a like amount to be advanced for the next four succeeding years.

Expenditures from the fund will not be limited to the income from the original fund, but may include all or

part of the principal in the fund at any time and may be supplemented by additional grants or contributions if the advancement of safety projects seems to justify additional financial aid.

Trustees of the foundation are: Henry Ittelson, president of Commercial Investment Trust Corp.; Arthur O. Dietz, president of Commercial Investment Trust, Inc.; and John W. Darr, vice-president of Commercial Investment Trust, Inc. An advisory committee, to be composed of prominent figures in present safety endeavors and other social projects, will assist the trustees in launching the C. I. T. Safety Foundation program and in the making of awards.

Numerous annual and occasional awards to individuals and groups for outstanding efforts in the cause of safety will be made. Emphasis will be laid on the capacity of these efforts to arouse public interest in the cause of traffic safety. Rules for the particular awards will be announced at a later date.

40 Years Ago

—with the ancestors of
AUTOMOTIVE INDUSTRIES

Foreign Notes

Count de Dion of the well-known Paris firm of De Dion, Bouton & Co., is building a number of steam omnibuses to carry 30 passengers.

Leon Bollée, inventor of a motor tricycle, is organizing a powerful company in Paris to manufacture his machine.

In the excursion from Paris to Meulan recently undertaken by the Automobile Club, 25 of the 33 vehicles taking part were propelled by Daimler motors, Peugeot Frères and Panhard Levassor being about equally represented. While there was no predetermined intent to race, when the excursionists were well out of the city, they crowded on speed with the result that two petroleum tricycles of De Dion, Bouton & Co. arrived first, having covered the distance of about 27 miles in one hour and 34 minutes. A steam brake, made by the same firm, finished third in one hour and 42 minutes.

—From *The Horseless Age*, June, 1896.

Carl-Mayer Corp. Organized To Make Ovens and Furnaces

The Carl-Mayer Corp., 3030 Euclid Avenue, Cleveland, has been organized to manufacture a complete line of industrial ovens and drawing and tempering furnaces. Carl Mayer, president, was formerly with Smith-Mayer Corp., oven and furnace builders, dissolved. C. A. Vining is vice-president.

Agreement on Price Bill Likely

Compromise Expected on Robinson-Patman Bills Giving F.T.C. Power to End Discriminatory Discounts

By L. W. Moffett

Quick agreement is expected to be reached between Senate and House conferees on anti-price discrimination legislation enacted by both branches of Congress. The principles of the two bills are identical. The Senate bill, sponsored by Majority Leader Robinson of Arkansas, was passed April 30. The House bill, sponsored by Representative Patman of Texas, was passed May 28.

The Senate bill exempts manufacturing from its terms and includes the Borah-VanNuys bill, which tightens the Clayton act as to price discrimination. The House bill carries neither provision. The latter had originally carried an anti-basing point provision. This was eliminated when the bill was reported. It also struck out the customer classification provision. Farm cooperatives had objected to the classification terms by which discounts were

(Turn to page 817, please)

maximum load of approximately 1200 lb., will be sold through regularly established automobile dealers, Mr. Gibson said. The trailer is mounted on two standard automobile wheels and tires. A list price of \$119.50, f.o.b., Salem, was announced. All-steel, with hinged cover and tail gate, the lines of the new trailer conform to those of the modern automobile. Production will start about July 1. Mullins expects to produce at least 10,000 units during the balance of 1936.

For the present, the trailer will be finished in one color, probably gun metal gray, or it can be shipped to dealers in the prime coating so that the unit may be finished to match the color of any motor car. The trailer weighs about 485 lb. and has an over-



The new trailer made by the Mullins Mfg. Corp. has ample room for the baggage of four persons

all length of eight feet. The body is 47 in. wide and 16½ in. high, although the extreme height of the body and lid is 29½ in. The wheels are stamped steel and the unit is carried on an eye beam axle.

Mullins All-Steel Trailer

Production of an all-steel, low cost, utility trailer for passenger cars by the Mullins Manufacturing Corp. of Salem, Ohio, has been announced by Charles C. Gibson, president.

The trailer, which is of modern, streamlined design and will carry a

New Spanish Plant for Ford

Company Surveying Sites for Factory to Make Most of the Parts as Well as Assemble Cars

Special to AUTOMOTIVE INDUSTRIES

Officials of the Ford Motor Co. are at present having surveys made in the neighborhood of Barcelona, Spain, in

order to find a suitable location for the complete manufacturing plant which the company is considering establishing there within the next two years. It is probable that the site finally chosen will be within the Free Port of Barcelona. The present assembly plant in the Avenida Icaria will be abandoned, if the company decides to extend its manufacturing operations.

Object of the new plant would be to manufacture many of the parts now imported from the United States in order to lower import duty costs. The capacity of the new plant would be about 100 cars daily. By locating the plant in the free port, the company would be able to reexport to other countries without payment of Spanish duties. It is reported that the commercial treaty recently concluded between Spain and Turkey, for example, makes possible the production of cars in Spain and their marketing in Turkey at a cost considerably under that of cars produced by the Ford company in England.

The present Ford unit in Spain is consuming an increasing amount of local material, the amount spent having risen from 4,379,005 pesetas in 1933 to 15,566,491 last year. Imports of foreign material, mostly from England, Spain and the U. S., amounted last year to 28,348,104 pesetas, according to officials of the company.

Details of the new Ford plant will not be announced until the location has been decided upon.

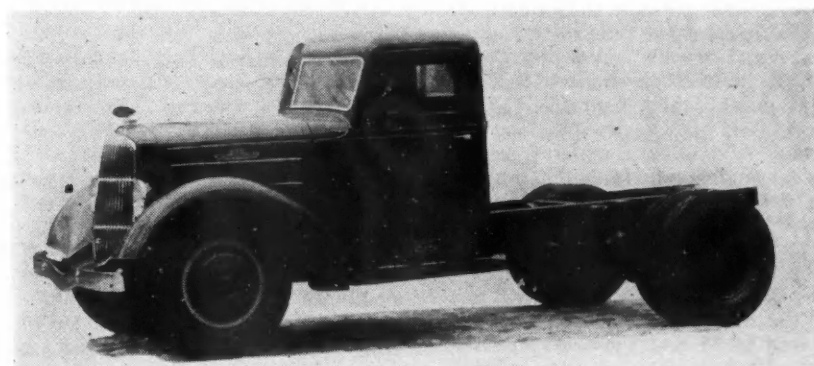
Reo Streamlines Trucks

Prices of 3-5 Ton Chassis Begin at \$1745, and 4-6 Ton Class at \$2775

A complete new line of 3 to 5 and 4 to 6 ton heavy duty trucks has been announced by officials of the Reo Motor Car Co., Lansing, Mich. Base chassis prices range from \$1745 and up for the 3-5 ton models and \$2775 up for the 4-6 ton units.

Six models are offered in the 3-5 ton class. These have a wheel base ranging from 153 in. to 185 in. Gross capacity ratings range from 18,000 lb. to 20,000 lb. and from 30,000 to 35,000 in tractor-trailer operation or with

(Turn to page 819, please)



Streamlining characterizes new Reo trucks

Hudson Local in UAW

Largest Independent Now Affiliated with A. F. of L.

Special to AUTOMOTIVE INDUSTRIES

The United Automobile Workers International Union issued a charter to the Hudson local of the Associated Automobile Workers of America last Monday, thus completing amalgamation of one of the leading independent unions in the motor industry with the A. F. of L. affiliate.

Locals of the Automotive Industrial Workers Association are still voting on the merger proposal and final returns are not expected to be compiled for another week. Richard Frankenstein, president, said that he had sounded out the sentiment of all the locals of his organization and is convinced that 99 per cent of the union's membership will favor merger, which when consummated, will bolster the U.A.W. ranks by at least 24,000 additional members. Frankenstein is candidate for the position left open on the U.A.W.'s general executive board, to give representation to the independent organizations that voted to come into the fold.

A campaign has been launched to organize the tool and die makers under the banner of the U.A.W. Local No. 7 of the Mechanics Educational Society, which is comprised primarily of tool and die workers in job shops, already has voted to affiliate with the U.A.W., and another local was to vote on the question late this week. An invitation to amalgamate has been extended to the entire M.E.S.A. but the movement was opposed by some of the high officials of the mechanics' union led by the general secretary, Mathew Smith. Considerable difference of opinion is said to exist in the organization and it is not unlikely that the tool and die workers will have to be brought into the A. F. of L. affiliate local by local or as individual members.

In proselyting mechanics the U.A.W. also will run into considerable opposition from the Machinists' Union of the A. F. of L. The United's charter from the Federation excludes machinists, but the union has taken them in before over protests of the other A. F. of L. union. U.A.W. officials expect there will be protest, but that nothing will be done about it. It was stated at U.A.W. headquarters that machinery is now being oiled up for a general membership drive.

Packard Announces Vacations With Pay for Plant Workers

Packard Motor Car Co. has announced plans for giving plant workers vacations with pay, for providing "separation pay" made up of vacation credits to those laid off from time to time due to reduction of working forces, and for special retirement pay to workers over 65 who have had service records of 15 years or more. The

vacation feature is the first in the motor industry since the depression. Recently Carnegie-Illinois Steel announced a similar plan, with respect to vacations with pay.

Employees on an hourly wage rate basis with a year or more of continuous service prior to June 1, 1936, will receive, beginning this summer a week's vacation with pay at their hourly rate.

Hupp Motor's Loss Reduced; Officials Plan New Financing

The Hupp Motor Car Co. reduced its loss in the first quarter of 1936 to \$265,965 from the figure of \$688,253 in the same period last year.

The balance sheet as of March 31 last showed current assets, including \$161,166 cash and marketable securities, amounted to \$1,002,455 and current liabilities \$773,351. Net sales for the March quarter amounted to \$191,116 compared with \$1,658,805 last year.

Wallace Zwiener, president of Hupp Motor Car Corp., in a letter to stockholders issued as part of the annual report makes the following statement:

"The Drake-Andrews litigation has been decided by the Circuit Court of Appeals. The decree of Judge Tuttle has been affirmed and the present board of directors has been confirmed in office.

"The directors of the corporation will now renew their efforts to arrange its business and financial affairs in such manner as to assure a resumption of operations on a conservative, profitable and permanent basis."

The letter does not mention plans under consideration for raising additional working capital necessary to resume operations, but it is understood that the plans which call for raising \$1,500,000 are progressing satisfactorily and that the management hopes to be in production next month.

Chevrolet Buys Durant Oakland, Calif., Plant

The Chevrolet Motor Co. has purchased the former Durant plant at Oakland, Calif., says an announcement by M. E. Coyle, president and general manager of Chevrolet.

"Our present assembly facilities at Oakland have proved inadequate to meet the demand for Chevrolet passenger cars and trucks," said Mr. Coyle. "We have, therefore, acquired this additional plant, which contains 315,000 sq. ft. of floor space. By Jan. 1, 1937, Chevrolet will have completed necessary rearrangements in both Oakland plants and will then operate them as one unit. Both passenger car and truck capacity will be increased when the new plant goes into operation."

The purchase of this plant will increase the number of Chevrolet assembly plants to 11 and the total number of Chevrolet manufacturing and assembly plants to 24.

GM Assembly in Poland To Get Parts Duty Free

Certain General Motors automobile parts will be imported duty free into Poland under the terms of a new contract with the Polish government. The company will assemble cars at the Lilpop Rau Lowenstein works at Warsaw. The arrangement will enable the company to reduce car prices by 50 per cent and it is probable that the Polish market will be dominated by General Motors.

The only other company with a similar contract is Fiat of Italy. Other manufacturers in England, France and Germany have been unable to make similar arrangements.

It is regarded as possible that on the basis of a license agreement, the parts may eventually be manufactured in Poland.



KARL HERRMANN has retired as vice-president and general manager of the Bantam Ball Bearing Co., but will continue in the capacity of consulting engineer. After a vacation, Mr. Herrmann plans re-entering some branch of the automotive field.

A. H. FRAUENTHAL, formerly assistant general manager of the Bantam Ball Bearing Co., has been promoted vice-president and general manager, succeeding Karl Herrmann, resigned. Mr. Frauenthal has been with the company since 1930, and was previously with Studebaker and Chandler.

E. J. LEES, formerly of Lees-Bradner Co., has been appointed chief engineer in charge of engineering and research of the National Tool Co., Cleveland. Mr. Lees is well-known for his work in designing and inventing machine tools.

E. R. L. BOYD was recently appointed sales manager of the Ray Day Piston Co., Detroit. Mr. Boyd is a graduate of Georgia Tech and for the past 17 years has been western divisional sales manager of the Waverly Oil Works.

A. D. GARDNER has joined the engineering development division of Wilcox-Rich. Mr. Gardner was formerly chief engineer of the Automotive Fan and Bearing Co., Jackson, Mich.

VINCENT YOUNG, formerly with Mack Trucks, Inc., has become assistant to Robert Jardine, chief engineer of Wilcox-Rich.

Cyrus Hall McCormick

Cyrus Hall McCormick, former president and retired chairman of the board of International Harvester Co., died last Tuesday at his home in Lake Forest. Mr. McCormick was 77 years old. He was the son of Cyrus H. McCormick, inventor of the reaper and founder of the old McCormick Co., the predecessor of International Harvester.

Automotive Metal Markets

No Test of New Price Structure Evidenced as Motor Buying Holds at Normal June Level

By William Crawford Hirsch

If automotive buyers of steel intend to cover this month more than that part of their July requirements which they would ordinarily provide for in June, so as to avoid having to place business early in July at the higher prices announced for the third quarter, there has been no indication of it so far. While, if precedent is followed, shipment of orders for some descriptions of finished steel, placed in June at the lower second quarter prices, will extend into the first half of July where mills find this to their convenience, there is no sign of a scramble to get in under the wire before prices go up. Only the developments of the next few weeks can shed light on the change in steel market sentiment in the past fortnight.

While it is too early to say that consumers have become reconciled to the price advance, it is obvious that only an entirely unlooked for decline in the demand can have any effect on the new price structure. Moreover, it does not look as though there would be any abnormal stocking by motor car manufacturers or parts makers to avoid an early test of the market.

Reassurance as to the steel industry's long-range price policies was seen in one of the papers presented at last week's meeting of the American Iron and Steel Institute, in which a prominent steel producer paired as fundamental principles the obligation of steel makers to market their output at fair prices, yielding the seller a reasonable profit, and to make constant efforts to lower the price to the consumer as the result of research and more efficient production processes.

There has been much misleading talk of late on the subject of possible foreign competition and this has been added to by this week's visit to the United States of the Earl of Dudley, head of the British Iron and Steel Federation, whose invitation to United States steel manufacturers to join the International Steel Cartel came as a complete surprise to them. His Lordship had apparently failed to post himself on our Clayton Anti-Trust Act or else he would have emphasized in his broadcast from the "Queen Mary" that his invitation pertained solely to the American steel industry's export activities. Recent publicity releases by the steel industry, pointing out the growing competition of foreign steel makers in the American market, would have been more informative, had the fact that no foreign steel figures in American motor car production been pointed out.

Pig Iron—The general impression in the markets is that prices will be permitted to continue unchanged for the present. Shipments to automotive foundries continue fairly heavy.

Aluminum—Steady and unchanged.

Copper—Makers of copper alloy ingots advanced prices for brass grade $\frac{1}{4}$ cent per lb. Sales of copper continue light at unchanged prices.

Tin—While the London market was closed because of the Whitsuntide holidays, New York importers took their cue from Singapore, where prices over the week-end declined sharply. As a result the price for spot Straits tin here was $44\frac{1}{2}$ cents at the beginning of the week, $\frac{1}{4}$ cent lower than at the preceding week's close.

Lead—Storage battery manufacturers are buying sparingly. The market is quiet and steady.

Zinc—Unchanged amid light demand.

Retail Sales Peak Broadens

Continued from page 781

Packard's May deliveries amounted to 7200, a new all-time record, exceeding that of August, 1929, by 10 units. There has been so far in June no perceptible decline in sales, according to officials of the company. There has been a large sales gain in the senior line, it is added.

Domestic retail deliveries of Buick cars passed the 100,000 mark during the second 10 days of May, marking the first time in six years that Buick unit sales have run into six figures. W. F. Hufstader, general sales manager, announced this week. He said that by the end of the 1936 model year Buick

will have produced and sold, domestic and export, exclusive of Canadian shipments, close to 170,000 units, practically duplicating the 1929 volume.

Buick sales during the second 10 days of May were 5549 cars, a gain of 13 per cent over the first 10 days and 142 per cent over the 2292 cars sold in May, 1935.

Shipments of current model Graham-Paige superchargers to date this year exceed the total for the entire year of 1935 by 243 per cent, according to Robert Graham, executive vice-president.

World-wide sales of Hudson and Terraplane cars in May amounted to 14,000 units, against 10,658 in May of last year, a gain of 31 per cent.

Pierce-Arrow has announced that the first quarter of 1936 marked a 41 per cent increase in its business as compared with the same period a year ago.

Higher production than in any month since 1929 was reported by Pontiac. The figure was 22,397 units, compared with 21,046 in April and 19,408 in May, 1935.

Nash reports shipments of 16,637 cars during the quarter ended May 31, the largest volume in five years, and comparing with 12,000 units in the corresponding period of last year. May shipments dropped to 4043 cars from 7012 in April.

At a meeting of the board of directors of the Budd Wheel Co., held last week, the regular quarterly dividend of \$1.75 per share, plus a participating dividend of 25 cents per share, on the first preferred stock of the company was declared to holders of record at the close of business, June 16, 1936, payable June 30, 1936.

Calendar of Coming Events

SHOWS

- Yugoslavia 16th International Spring Fair, Lubiana May 30-June 11
- Olympia Motor Show, London, England, Oct. 15-24
- National Motor Truck Show (N. J. Motor Truck Assn.), Newark, N. J., Nov. 3-7
- National Automobile Show, Grand Central Palace, New York Nov. 11-18
- International Aviation Show, Paris, France Nov. 13-29
- Boston Automobile Show Nov. 14-21
- Columbus Automobile Show Nov. 14-20
- Chicago Automobile Show Nov. 14-21
- Detroit Automobile Show Nov. 14-21
- Washington, D. C., Automobile Show, Nov. 14-21
- Cincinnati Automobile Show Nov. 15-21
- St. Louis Automobile Show Nov. 15-22
- Baltimore Automobile Show Nov. 21-28
- Brooklyn Automobile Show Nov. 21-28*
- Cleveland Automobile Show Nov. 21-28
- Kansas City Automobile Show Nov. 21-29*
- Milwaukee Automobile Show Nov. 22-29
- Peoria Automobile Show Nov. 30-Dec. 5*
- Philadelphia Automobile Show, Nov. 30-Dec. 5*

* Tentative dates.

- Natl. Exposition of Power & Mechanical Engineering, Biennial Meeting, New York City Nov. 30-Dec. 5
- Automotive Service Industries Joint Show, Chicago Dec. 9-14

CONVENTIONS AND MEETINGS

- National Association of Credit Men, 41st Annual Convention, Richmond, Va., June 8-12
- National Oil and Gas Power Conference, American Society of Mechanical Engineers, University of Michigan, Ann Arbor June 24-27
- American Society for Testing Materials, Annual Meeting, Atlantic City June 29-July 3
- National Association Power Engineers, Annual Meeting, Chicago, Aug. 31-Sept. 4
- American Transit Association, Convention, White Sulphur Springs, W. Va. Sept. 21-24
- First Aircraft Production Meeting of the S. A. E., Los Angeles Oct. 14-16
- American Society for Metals, 18th Nat'l Congress, Cleveland, O. Oct. 19-23
- American Gas Association, Annual Meeting, Atlantic City Oct. 26-31
- American Petroleum Institute, Annual Meeting, Chicago Nov. 9-12
- Natl. Industrial Traffic League, Annual Meeting, New York City Nov. 19-20



Rear Axle Starts Here—

on its way through the assembly line. Torque tube and differential carrier assembly is fed to the line by the overhead monorail.

Buicks on the Line

are the visible symbols of a versatile production system that can be tuned to any demand

By Joseph Geschelin

WHEN the Buick Motor Company embarked on its plant modernization program involving an expenditure of over \$14,500,000 during an 18-month period ending in 1935, it laid the ground work for one of the biggest success stories in automotive history. One need only consult the registration figures for the past six months to appreciate how thoroughly the 1936 Buick line has captured the imagination and pocket-books of car buyers.

Let it be noted that this achievement is due in great measure to the broad vision of Buick's chief, Harlow H. Curtice, who took over the reins in October 1933. It needed an accurate estimate of public fancy to lay the plans for the advanced styling, luxurious comfort, and outstanding performance embodied in the 1936 line. But it took vision and high courage to plan as far back as the early days of 1934, a new order of things in the manufacturing departments—modern production machinery, new production planning, and the utilization of the most advanced techniques known to the metal cutting industry.

These profound changes made possible the production of the present line with styling and quality and dependability consistent with Buick tradition but at delivered prices unmatched by anything in its previous history. Yet the production economy of the set-up is so well balanced as to safely amortize the capital expenditure in keeping with good business principles.

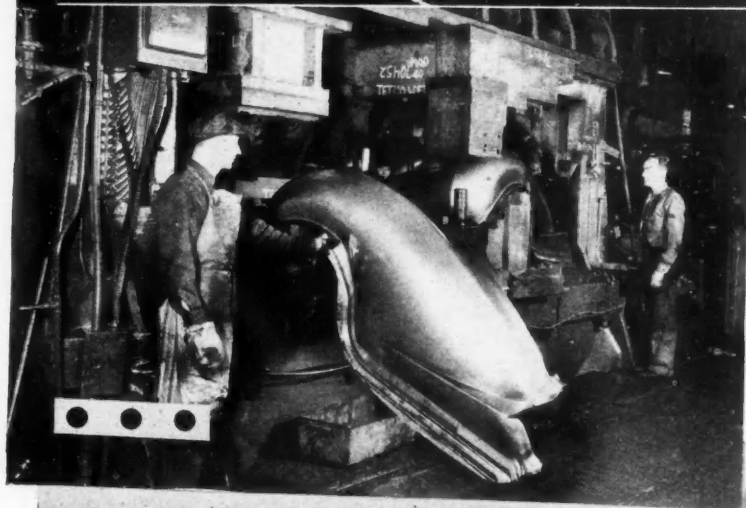
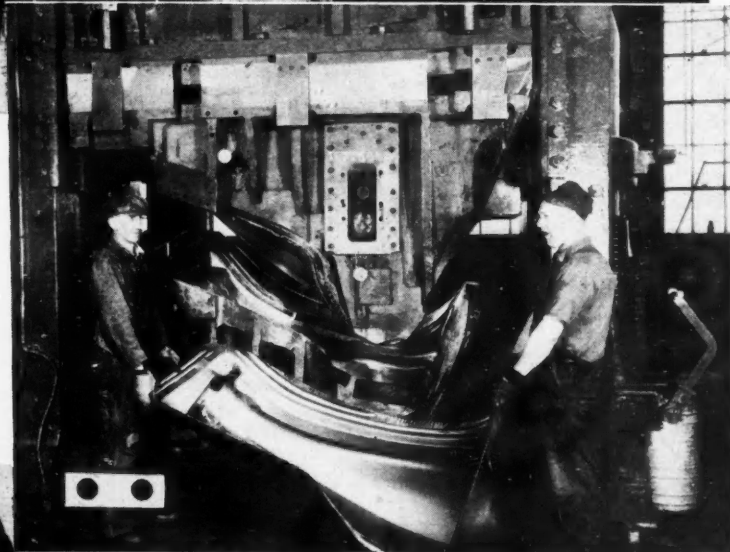
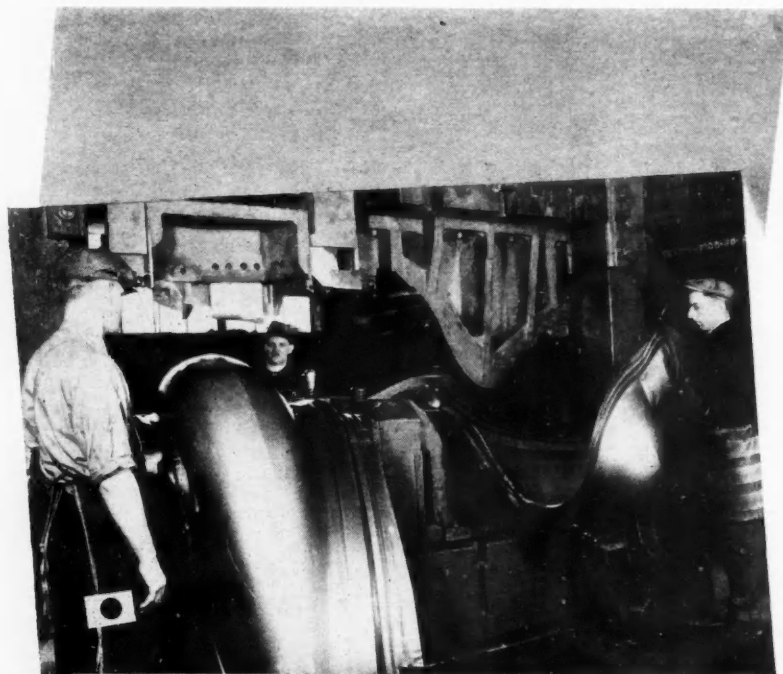
An interesting commentary on how H. H. Curtice operates is the fact that the modernization program just com-

pleted is by no means a one-time shot to bring things up-to-date. It was in reality only a step toward a goal. From now on we may expect to find a regular program of improvement in every department with changes large and small consistent with the progress in manufacturing techniques. As this article goes to press, for example, a great

many items of new equipment are being placed in service here and there, each one representing the last word in its field.

The Buick line for 1936, as is well known, comprises four series—the Series 40, 60, 80, 90—with six body styles in the Series 40 ranging from \$765 at the factory; five body styles in the Series 60 ranging from \$1035 list; a convertible phaeton and four-door sedan in the Series 80; and four body styles on the Series 90 ranging from \$1695 list.





Among the options in the line are—extra wheel equipment, special paint, special trim, heaters and radio installations, as well as five special accessory packages. These options coupled with chassis options produce the tens of thousands of variations in scheduled orders that have to be handled on the assembly lines.

The Buick plant is one of the largest and most complete manufacturing establishments in the industry, including a large modern foundry and a fine forge shop. The complete list of manufacturing divisions showing the scope of operations in Flint is as follows:

Motor plant.

Axle machine and assembly.

Differential machine and assembly.

Transmission machine and assembly.

Forge shop.

Foundry.

Sheet metal plant.

Tool manufacturing.

Service machine shop.

Final assembly.

Each of these divisions is a self-contained unit housed in its own building, rather than a department set up within a large building, as is usually the case. In a table giving the list of factory executive personnel, we have named the head of each of these manufacturing departments, listing also those in the service organization such as the inspector, master mechanic, factory accounting, etc.

Those who have been close to the Buick factory are no doubt familiar with the big changes that took place in the manufacturing divisions in paving the way for the 1936 line. Take the foundry as an example. It was completely modernized in the fall of 1935 by the installation of some of the finest

● Front fender group—restrike on Toledo press equipped with two separate dies, one for forming the front end, the other for the rear end.

● ● Front fender group—first draw on Hamilton press, shown here, follows the leveling machine operation.

● ● ● Front fender group—trim operations completed on this huge Toledo press. It has four separate dies, two in front and two in the back, for trimming at various points.

foundry equipment known to the trade. You will find here the last word in molding machines of large and small capacity, an installation of core blowers which probably represents their first large scale use in this industry, and an experimental slag conveyor which promises to remove one of the most troublesome problems connected with foundry operations.

Then, too, the foundry executives are particularly proud of their new Dry-Sys core baking ovens, an oil-fired equipment producing better core quality with less rejection losses and considerable economy of time and handling.

The forge shop which accounted for over \$750,000 of the appropriation also was completely modernized and had a marked influence on the improvement in crankshaft production. New hammers, heat treat equipment, and processes for holding the forgings to close limits cooperated with the machining line to reduce fabrication costs almost 60 per cent. But more of this when we get to the motor machine shop.

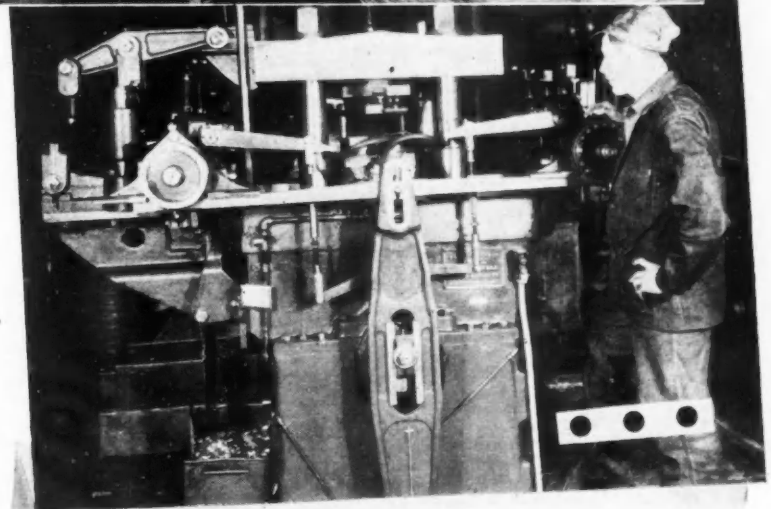
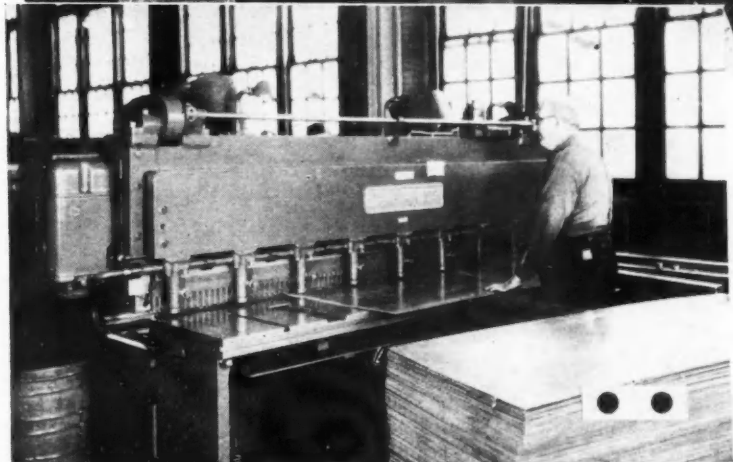
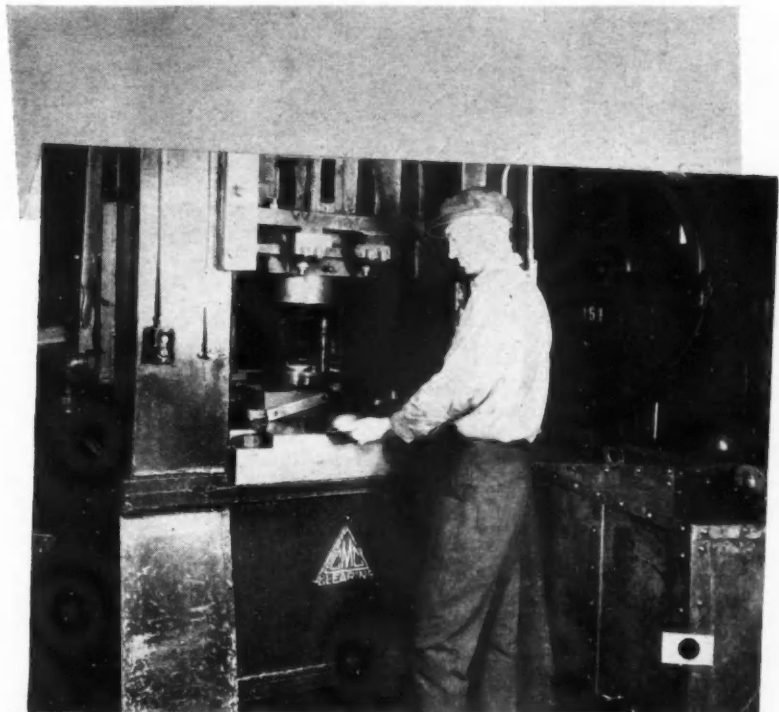
New alloy pistons with anodic finish were a novel feature and brought to the fore one of the first high production anodic treatment departments. Here was probably the first use of the Abrasimeter for routine testing of the finish to assure the desired quality both of surface finish and hardness.

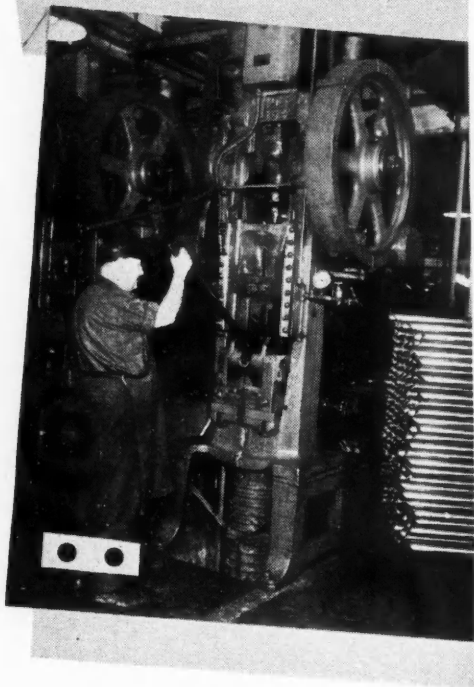
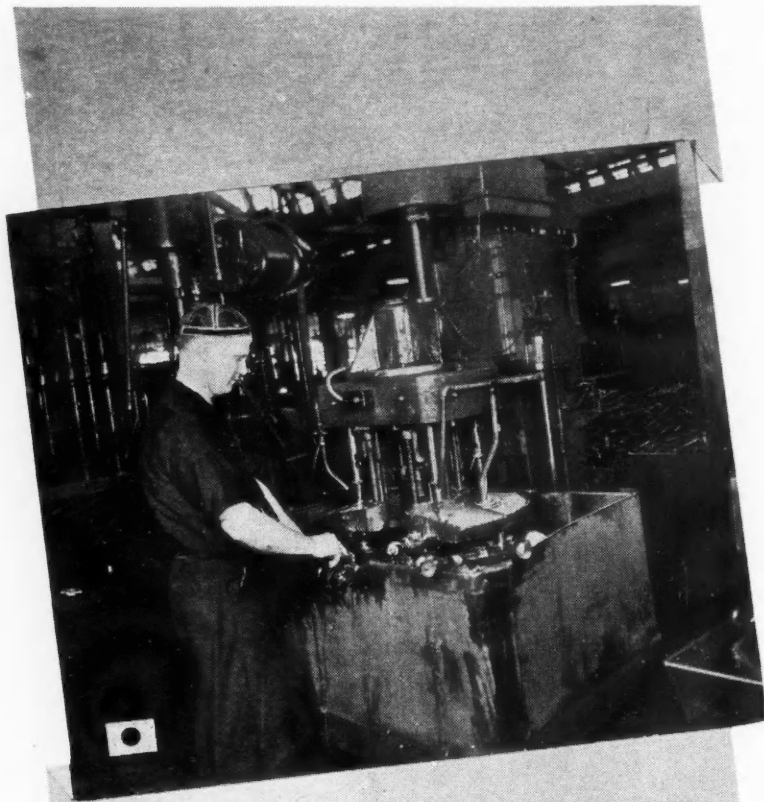
Another of the new features was the first production installation of the Sprabonderizing process. Prior to the application at Buick, the corrosion resistant surface on sheet metal parts was imparted by dipping in large tanks while now it is possible to apply the coating rapidly and more economically by spraying the sheet metal as it moves along on the overhead conveyor line.

● One of a battery of Clearing presses. This press, of 250 ton capacity, is used in the fabrication of retainer stampings. It is supplemented by another Clearing press of 700 ton capacity on the same set-up.

● ● New Cincinnati shear with electric hold-downs and automatic gaging has improved quality, facilitated handling, and greatly has increased output. This machine has a capacity of $\frac{1}{4}$ -in. mild steel sheet.

● ● ● One of the Henry & Wright automatic dieing machines recently installed in this plant has solved the problem of economical production of small washers and small intricate punchings.





● This Baker drill has been tooled for drilling, counterboring, and reaming the ends of the steering knuckle support. The indexing table is provided with six stations.

● ● Tailpipe tubing is bent into many intricate forms in successive operations on a battery of Toledo presses, one of which is shown here.

The transmission plant provided the biggest news of the year what with the development of procedures and specialized equipment for the economic production of gears of exceptional quality. It was recognized that gearing requirements of today need more than good production control or heat treatment procedure. The metallurgical staff found it necessary to go back to the steel mill for the primary control of the finished gear, then from the steel mill to the forge shop for accurate control of blanks. The blanks are now forged to precise procedure using controlled specification steels. In general, the blanks are pierced in forging and the first steps in the machine shop include the turning of centers from which the work is held on all succeeding operations.

Gear research at Buick determined that the best way to combat a certain

Sequence of Major Operations

Mass balance
Center both ends of shaft & load on racks
Mill locating spots

Rough turn, check main brgs. & rough turn ends complete
Straighten line brg.
Rough grind thrust brg.
Mill driving spots on No. 7 cheek
Finish turn main brgs. & both ends complete

Finish turn both ends all line brgs. except center line bearings
Semi-finish grind frt. center & rear center bearings
Semi-finish grind front & rear bearings
Turn check on pin brgs.
Rgh. & finish turn all pins; leave .040 in. on dia. & .030 in. on width
Straighten to check main bearings
Drill 3/16 in. oil hole in Nos. 1-3-6 & 8 pin brgs. & 5/16 in. hole in center bearing

Drill 3/16 in. oil hole in Nos. 2-4-5 & 7 pin brgs.

Drill 5/16 in. oil hole from frt. bearing to No. 1 pin, rear bearing to No. 8 pin, frt. ctr. brg. to No. 3 pin & rear ctr. brg. to No. 6 pin

Drill 5/16 in. oil holes from No. 5 cheek to ctr. brg. R. C. brg. to No. 7 pin No. 8 cheek to ctr. brg. & F. C. brg. to No. 2 pin

G. M. Balancing Mach.
Buick Centering Mach.
Cinn. No. 3-36 Cinn. Duplex Hydraulic

7-1 H. C. LeBlond Lathe
Spec. Buick Straightening Mach.
12x36 in. Landis Plain Grinder
48 in. Cinn. Duplex Mill Mach.
9-ACL LeBlond Lathe Drum Type Indexing Lathe Mach.

No. 4-AC LeBlond Center Drive Lathe

10x36 in. Landis Crankshaft Grinder
10x48 Landis Hydraulic Grinders
6-AC Dbl. Spdl. LeBlond Lathe

LeBlond Pin 5-AC Lathe
Special Buick Straightening Mach.

Special Avey Hydro. Electric Drill
Hisey Floor Grdr.

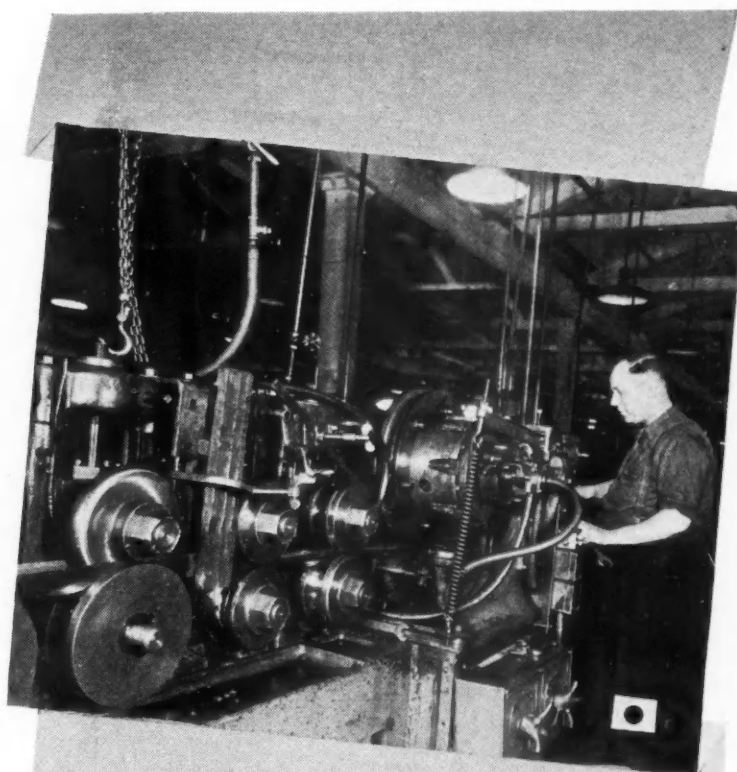
Special Avey Hydro. Elec. Drill Mach.
Hisey Floor Grdr.

Special Avey Hydro-Elec. Drills.
Floor Grdr.

Spec. Avey Hydro-Elec. Drills Mach.
Hisey Floor Grdr.

unavoidable degree of distortion in firing was to compensate for it in the initial form of the gear tooth profile. So for the first time the gear making art became conscious of a procedure in which the gear tooth profiles were "shaved" to a special form which results in the desired form after coming through the heat treat.

The foregoing touches briefly on some of the high spots of the changes wrought at Buick in preparation for the new program. We are now prepared to examine more in detail the organization and equipment of the various manufacturing divisions, with the aid of factory routings showing the procedure on some of the major parts of the car. During the course of this analysis we shall have occasion to point out places where even more advanced practice is being brought to



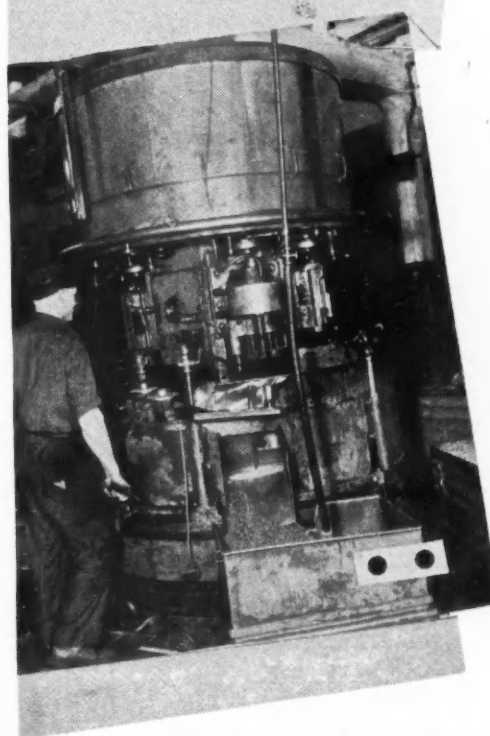
— Buick 40 Crankshaft

Finish grind thrust brg.
Finish grind rear ctr. brg.
Finish grind frt. ctr. brg.
Finish grind frt. brg.
Finish grind rear brg.
Finish grind No. 1 & No. 8 pin brgs.
Finish grind No. 2 & No. 7 pin bearing
Finish grind No. 3 & No. 6 pin brg.
Finish grind No. 4 & No. 5 pin brg.
Straighten line brgs.
Grind flange face & pilot
1st Position. Load
2nd Position. R. H. head. Drill flange
23/64 in. ctr. hole 1-1/4 in. dia. L. H.
head, drill ctr. hole 43/64 in.
3rd Position. R. H. head, c'bore 1.3125 in.
chamfer ctr. hole & bolt hole. L. H. head.
Ream .6875 in.
4th Position. R. H. head—undercut L. H.
head
5th Position. R. H. head. C'bore 1.365
in. ctr. hole. Finish rear flange holes
(4) .372-.375 in.
L. H. head. 3/4-16 in. Am/Nat
Bore & ream pilot hole
Finish grind sprocket & pulley bearing
Mill keyway in sprocket pilot
Straighten line brgs.
Check & mark for balance
Drill for balance
Check for balance
Drill for balance
Rough & finish lap all pin & line brgs.
Inspect
Burnish thrust brg.

10x48 in. Landis Hydr. Grdr.
10x48 in. Landis Hydr.
10x48 in. Landis Grdr.
10x48 in. Landis Grdr.
10x48 in. Landis Grdr. Grinder
16x42 in. Landis Hyd. Grdrs.
16x42 in. Landis Grdr. Grinder
16x42 Landis Hydr.
16x42 in. Landis Grdr.
Buick Straightening Mach.
12x36 in. Landis Grdr.
2-Way Horizontal Hyd. Natco

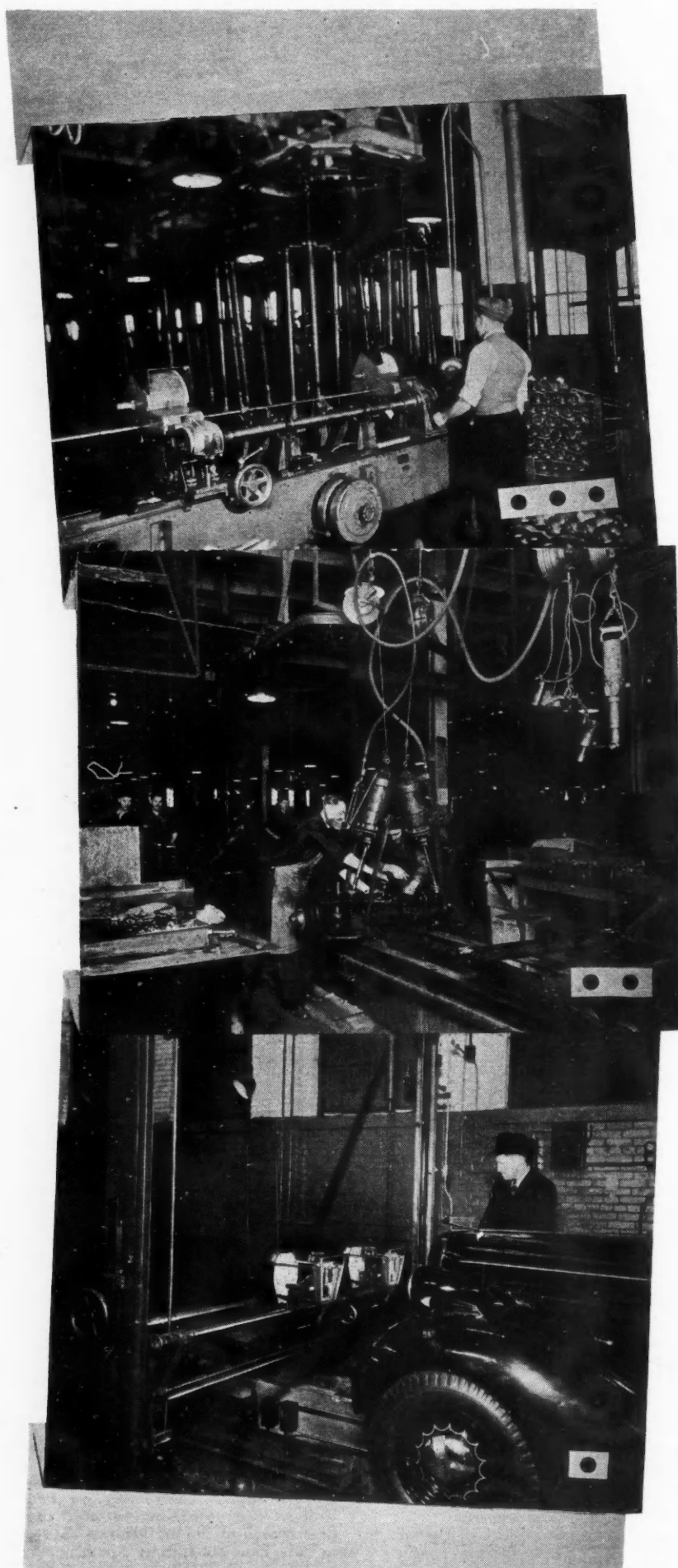
Automatic Index

No. 5 Warner & Swasey Screw Mach.
10x42 in. Landis Plain Grinders
No. 1 Cinn. Milling Mach.
Buick Straightening Mach.
GMC Balancing Mach.
21 in. Cinn. Drill Press
GMC Balancing Mach.
21 in. Cinn. Drill Press
No. 50 Norton Oil Lapping Mach.
Landis Grinder



● Tubing for tailpipe and similar uses is formed on machines of this type and welded automatically as the formed tube passes through the welding head at the right. A similar machine is used for making muffler housing tubes.

● ● Front wheel hubs are machined almost completely on two Bullard Mult-Au-Matic set-ups, the first machine being shown here. This is a six-station machine.



bear to yield further economies and improvements.

Despite the strides made last year in modernizing every department, the work of improvement is moving apace as will be evident from the examples we shall give of new equipment now swinging into production. Perhaps the best lesson to be learned here is that the factory men in pooling their skill with that of the machine tool industry seemingly find no end to the process of simplifying and expediting metal cutting operations. You hear of an operation which just seems to be the last word in the art, then before long you find that procedure thrown into discard by something much better and more economical. At Buick these things are taking place at accelerated pace right before our eyes.

Let us now take a brief excursion through some of the main divisions of the Buick plant, noting high spots here and there, and commenting upon some of the changes that are taking place.

Motor Plant

A fairly comprehensive report on this division was published in *Automotive Industries*, September 14, 1935, just a week before the 1936 line was announced. From the point of view of news, the most interesting development at that time was the introduction of the new alloy piston with hard anodized finish—completely tooled up with a line of new equipment.

A battery of Fay automatic lathes is used for coring, centering, cam turning, grooving, etc., while the rough and finish grinding of contour is handled

● Propeller shafts are checked for dynamic balance on this new GMR balancing machine. Readings are taken on indicators mounted at each end of the machine.

● ● Air-operated clamps are used on the chassis line to compress knee-action coil springs while the front end is fastened in the frame.

● ● ● Massive framework directly over the assembly line carries the headlamp adjustment fixture consisting of two pairs of condensing lenses adjustable laterally and up-and-down for every model in the line.

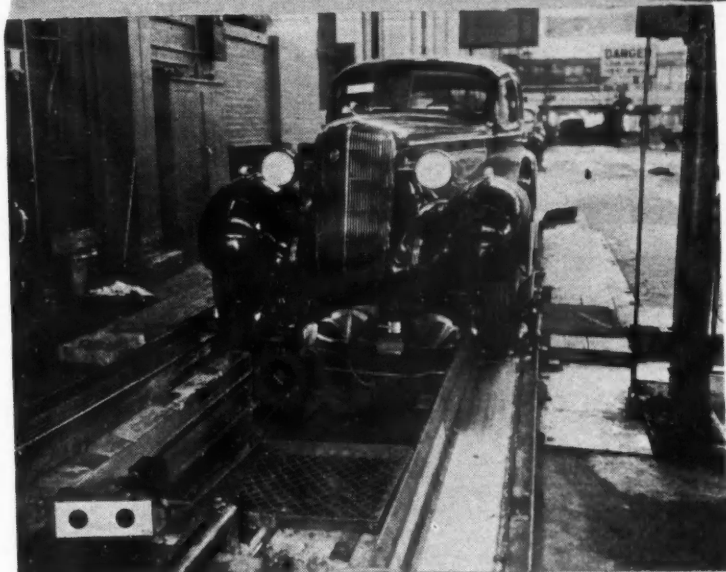
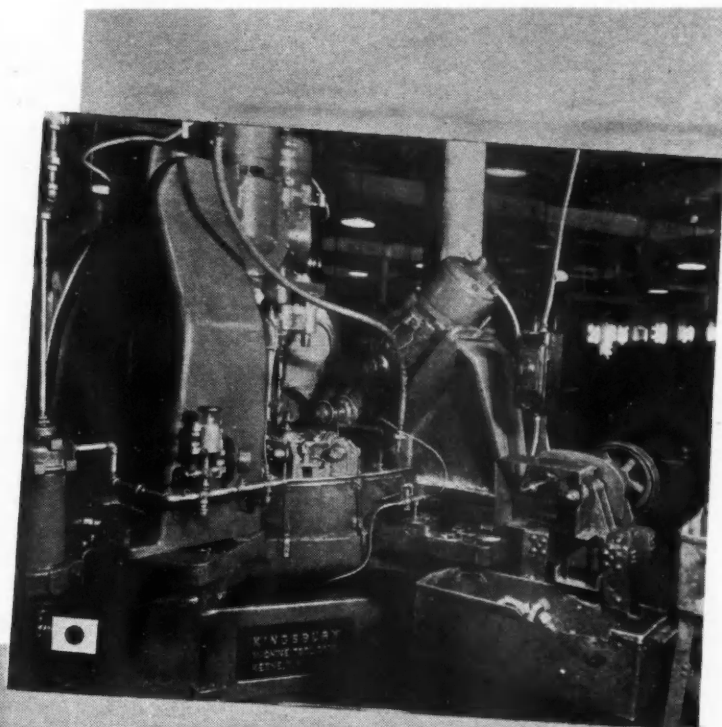
on a battery of 10x36 Norton plain grinders. There is a novel multiple-head Kingsbury machine used for drilling saw slot holes and cutting saw slots automatically in the piston. Mention also was made of the Ex-Cell-O diamond boring machines, handling three pistons at a time, diamond-boring the wrist pin holes after anodizing.

The piston department last year incorporated the very last word in automatic anodizing equipment, using a Meaker automatic return conveyor. Here too was the first use of the Abrasimeter for routine checking of anodized coating hardness.

The piston machine line features the use of cemented-carbide tools as well as the diamond-tipped tools on the Ex-Cell-O boring machines.

Perhaps the biggest improvement in engine manufacture known to the industry had its birth in this plant with the introduction of the G.M.R. mass balancer for balancing and centering crankshaft forgings prior to machining. We are told that this operation cuts machining costs materially by eliminating between 60 and 70 per cent of the usual corrections on final machining operations. Not only has this cut machining time and cost but it has reduced the amount of material that goes into the forging.

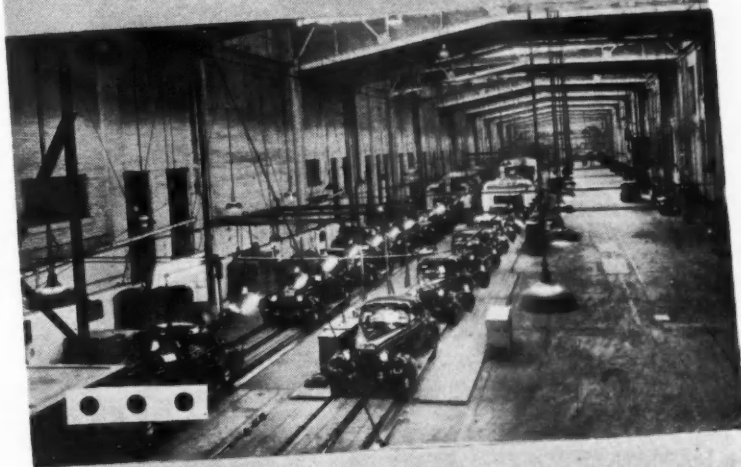
Last season Buick installed some Landis grinders equipped with the new air-sizing attachment for automatic rough-grinding of camshaft bearings. This proved so successful that another battery of Landis grinders was brought in to handle the finish-grind as well.

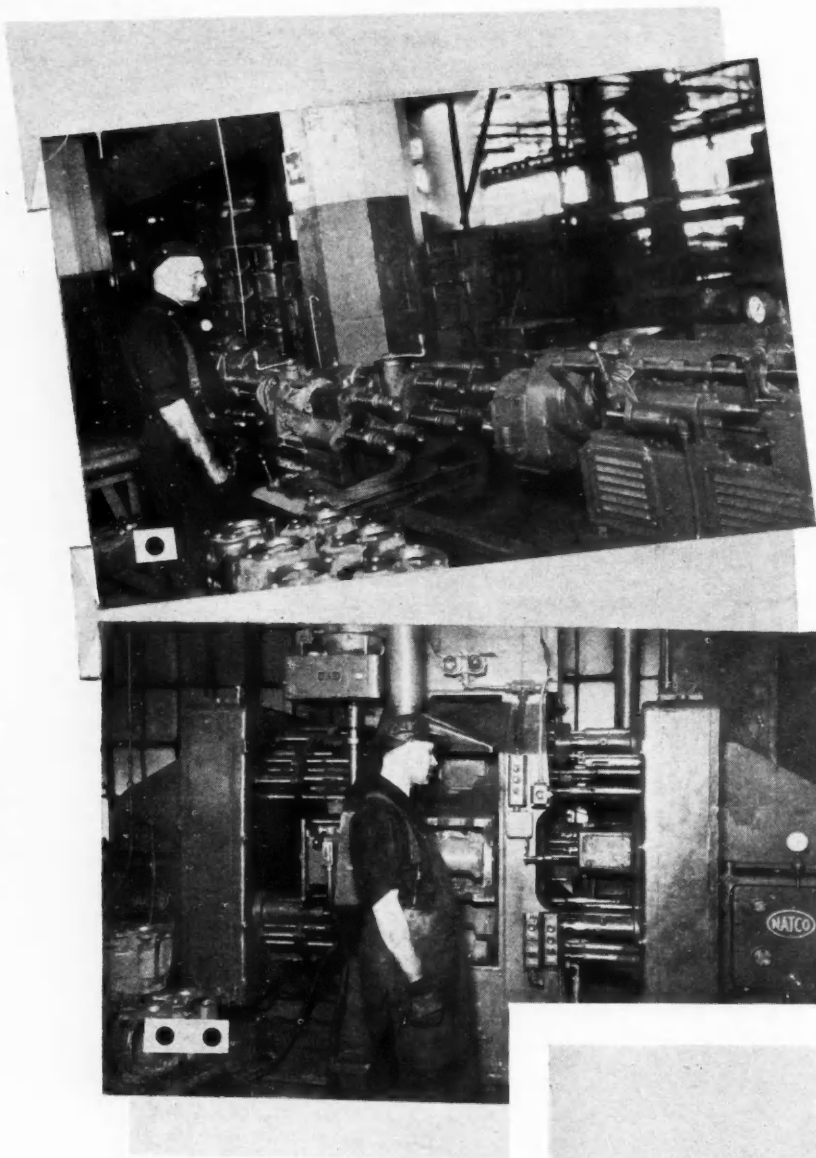


● Special Kingsbury machine for finishing differential carrier caps, drills, spot-faces, and mills bosses, in one set-up.

● ● This pit, directly at the headlamp adjustment fixture, handles the important operation of front wheel alignment. Note how the front wheels are cramped in on roller sections set in the assembly conveyor track. Dial gages give the operators information concerning the adjustments required to produce standard toe-in and camber.

● ● ● General view of final assembly floor looking down from the last station. Directly in the background are the two Dry-Sys ovens used for baking repairs. The station in the foreground is the final O.K. line.





● W. F. & John Barnes horizontal machine for line reaming on Model 40 transmission cases. Semi-finish and finish-ream idler and camshaft holes; Rough, semi- and finish-ream rail holes.

● ● Natco combination two-way drilling and tapping machine for drilling and tapping ends of transmission case.

In addition, the new Landis air-sizing grinder has been installed for the automatic grinding of camshaft cam contour.

In fact, within a short time after the publication of this article many big changes will have taken place in the

relatively new set-up described last year. For example, last season the fly-wheel housing was tooled on two different Foote-Burt drilling machines—one for drilling and boring, the other for tapping. These are huge six-head machines representing the best practice known today. We are told that some new Foote-Burt machines are on the way which combine in one setting most of the operations previously performed on separate machines.

Crankshaft production is expected to show profound improvement first because of the introduction of mass balancing and secondly through the use of a new LeBlond lathe for turning main bearing complete in one setting. This machine, used for the first time in the industry, has a drum-type fixture for loading three shafts at a time. Each station has a separate set of tools, the tooling being so designed as to distribute the brunt of metal removal over three overlapping sets of tools. This ingenious application of a time-tried principle not only produces a saving in time and cost, but it reduces the load on the machine during any part of the cycle to such an

Sequence of Operations — Buick 4

2nd Station. Load & drill flange holes

4th Station. Finish face flange & end of pilot. Semi-finish. Turn pilot & chamfer pilot.

Bore clearance in bearing chamber. Chamfer bearing chamber & bore web dia.

6th Station. Cut snap ring grooves & finish face bottom of bearing chamber

8th Station. Finish turn pilot O.D. of

finish bearing chamber

Machine all holes in flange End & Side of

part

1st Position. Load

2nd Position. Loc. "A," drill (1) 55/64

in. hole. Loc. "B," drill (1) 3/8 in.

hole & (6) .261 in. holes

3rd Position. Loc. "A," ream (1) 55/64 in. hole. Loc. "B," countersink (6) holes & drill (1) 3/8 in. hole

4th Position. Loc. "A," drill small speedo hole. Loc. "B," tap (6) holes 5/16-18 in.

5th Position. Loc. "A," comb. rough s'face bosses. Loc. "B" (rear angular head), drill (1) "U" hole

6th Position. Loc. "A," finish s'face speedo bosses. Loc. "B" (rear angular head), countersink "U" (.368) hole. Loc. "B" (right angular head), drill 5/16 in. angle oil hole

7th Position. "Loc. "A," rough ream small speedo hole. Loc. "B" (rear angular head), tap (1) 7/16-14 in. hole

8th Position. Loc. "A," line ream speedo holes

9th Position. Loc. "A," tap speedo holes.

Mill face of C-shaft lock boss

Spotface C-shaft lock boss

Wash

Inspect

Natco Special Drilling & Tapping Mach.

No. 2 Kent-Owens Hand Mill

14 in. Leland Gifford Press

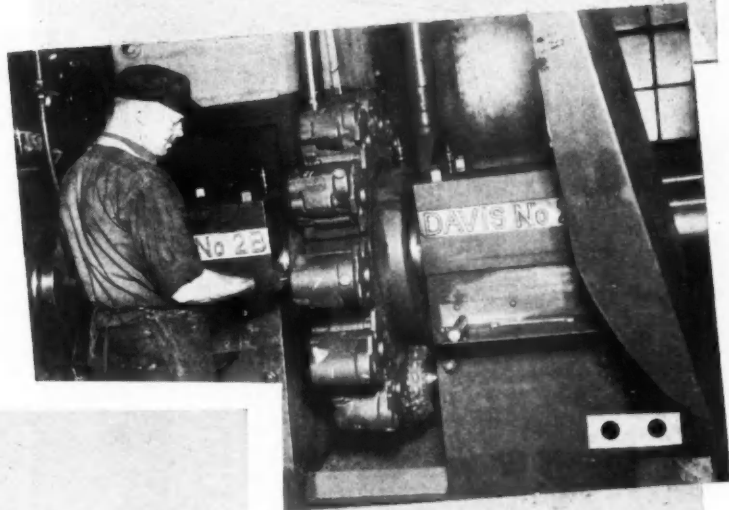
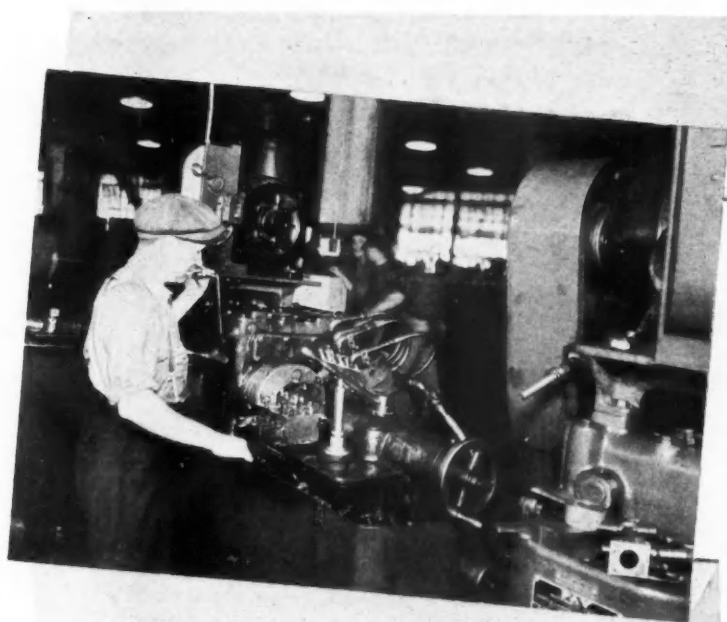
Hot Water Tank & Air Hoist

Bench

extent that this new machine is much smaller in bulk and motor rating than any previous machine of the single-station type.

The battery of Leland-Gifford crankshaft oil hole drilling machines has worked out so successfully that its use is assured in Buick production. These machines are equipped with the step-by-step hydraulic feed which eliminates drill breakage and serves to step up production rates materially.

The motor industry will watch with greatest interest the introduction at Buick of the single-point method of cylinder boring using an eight-spindle precision boring machine developed by Ex-Cell-O. All eight spindles are mounted in line and each is individually driven. The fixture table is so designed that the block is loaded in a vertical position directly from the conveyor line and then shifted to the inclined position. Interlocking devices are provided so that the boring units will not be fed down to the work or returned to starting position until each operation is properly cleared. The block is moved sidewise 1/64 in. to clear the cemented-



Transmission Rear Bearing

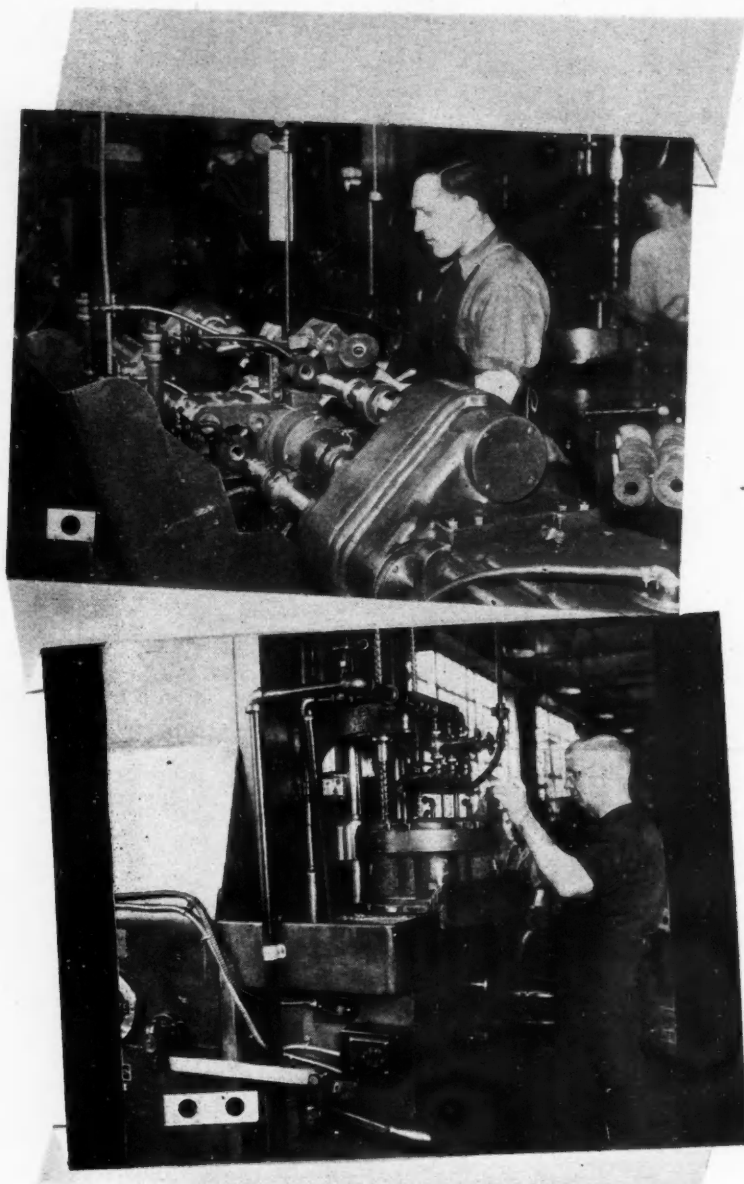
- Rough & semi-finish turn 4.060-4.062 in. pilot dia. Rough & finish face end of pilot. Rough & semi-finish face flange. 8 in. Bullard Multi-Au-Matic Mach.
- Rough bore, finish bore & rough ream 2.4398-2.4408 in. bearing chamber to 2.437-2.438 in. dia. to within .005 of bottom. Rough & finish bore 2-3/16 in. hole at bottom of bearing chamber. Countersink bearing chamber 1/16x90 in.
- 1st Station. Load.
- 2nd Station. Rough turn pilot dia. to 1.115-1.125 in. Rough bore 2-3/16 in. dia. hole at bottom of bearing chamber. Rough bore bearing chamber to 2.411-2.425 in. Chamfer bearing. Chamfer 1/16x45 deg. groove flange to divide out for next operation.
- 3rd Station. Rough face flange.
- 4th Station. Semi-finish face flange. Finish face end of pilot. Chamfer end of pilot. Semi-finish. Bore bearing chamber to 2.426-2.433 in. dia., semi-finish. Bore 2 3/16 in. dia. hole thru web. Bore 2.443-2.448 in. dia. in bearing recess
- 5th Station. Rough ream 2.4398-2.4408 in. dia. bearing chamber to 2.437-2.438 in. dia. to within .003 in. of bottom of chamber, semi-finish. Turn pilot to 4.085-4.087 in. dia. finish. Ream web dia. to 2.187-2.189 in.
- 6th Station. Hollow mill 4.060-4.062 in. pilot dia. to 4.075-4.077 in.
- Grind tools on Bullard Oper. Norton Tool Grinding Jack
- Finish machine both ends Bullard Multi-Au-Matic
- 1st Station. Load
- 3rd Station. Rough face, C'Bore & end of part, rough & turn O.D. & C'Bore dia. rough face web & turn gear clearance
- 5th Station. Semi-finish face C'Bore finish face end of part finish turn O.D. Semi-finish turn C'Bore dia. & finish face web.
- 7th Station. Finish face C'Bore
- Finish turn C'Bore

● Fay automatic lathe turning shank of clutch gear.

● ● Rough and finish milling of front and rear ends of case on 2-B Davis Thompson drum type milling machine.

carbide tools before the heads and spindles are withdrawn.

With single-point boring it is possible to produce bores that are straight and round within 0.0003 in. with high finish and a uniform diameter of each bore of the same set. By single-point boring after reaming, it is possible to



● Sundstrand special two-way machine for counterboring, rough center and finish center both ends of gear blanks.

● ● First operation on countershaft gears is rough, semi-and finish-broach main hole in the forging on 3-H LaPointe broaching machine.

reduce the honing operation to a minimum number of strokes and yet produce a high finish, with an accuracy hitherto unapproached.

Turning for a moment from the major operations, we find evidence of great activity in the screw machine bay set up in this plant. They have recently

set up a large battery of new screw machines of various makes all featuring an entirely new order of metal cutting practice. Here is a Brown & Sharpe automatic screw machine for producing pivot screws. It features a high speed attachment for drilling a number of small holes in the hexagon screw head. An automatic loading hand picks the work from the main spindle chuck and transfers it to the drilling attachment where the work is indexed automatically, then the piece is ejected. These operations all occur within the fast cycle of the machine.

In this battery, also, are two new Britain-Gridley automatics and four National Acme Gridley machines. Of the latter, two are tooled to produce the push rod lower end at the rate of 4.5 seconds per piece while the other two turn out the valve adjusting ball stud at the rate of six seconds per piece. In both cases the single setting takes care of producing a flat on the ball end which previously required a separate grinding operation while on the ball stud. The same setting of the six-spindle machine also slots the threaded end of the piece. These operations were described in detail in a previous issue of *Automotive Industries*.

The pictorial section of this article will give you a large number of examples of the equipment in the motor plant. We supplement this with detailed routings giving the sequence of operations on the Model 40 crankshaft and the flywheel housing.

Buick Factory Executive Personnel

H. H. Curtice
C. T. Scannell
D. E. Williams
E. H. Kramer
H. C. Young
A. T. Brabyn
R. M. Wagner

F. D. Elwell

R. H. Archer
R. B. Schenck
C. H. Ofield
O. W. Young
R. H. Darnton
F. G. Hoekle
J. T. Hammond
Harry Heron
G. O. Connolly

L. D. Parker
B. H. Newell
H. A. Smith

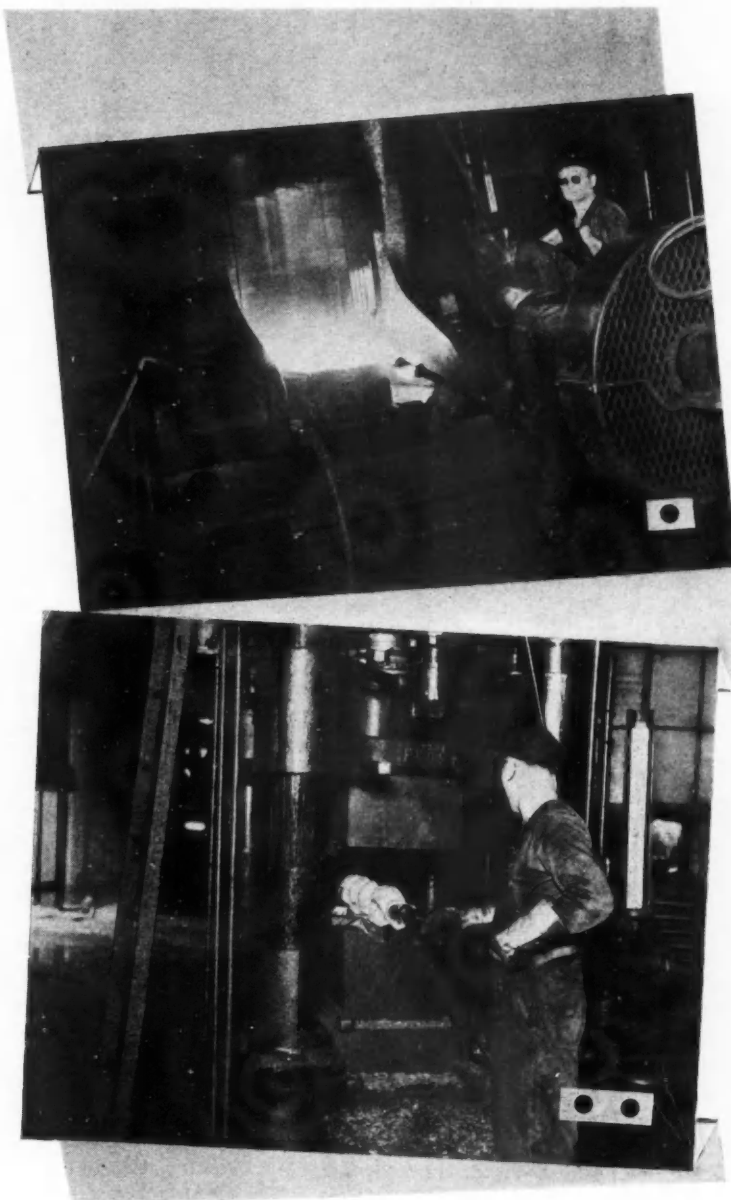
President & General Manager
General Manufacturing Manager
Comptroller
Personnel Director
Factory Accountant
Master Mechanic
Production Manager &
Material Supervisor
Works Engineer
By Products & Plant Protection
Chief of Standards
Chief Metallurgist
Chief Inspector
General Superintendent
Forge
Assembly
Motor
Sheet Metal
Transmission
Past Model Parts
Axles — Differential
Foundry
Service Parts Machining

Transmission Plant

Probably the most intriguing layout of operations and variety of equipment will be found in this department. Some of the most modern production machinery of the day is represented here, including—Michigan Tool gear shavers, National Broach & Machine gear lappers, Barber-Colman gear hobbers, Gould & Eberhardt eight-spindle hobbing machines, Fay automatic lathes for turning gear blanks, Fellows gear shapers, and Bullard Mult-Au-Matics as well as the new Model J eight-spindle vertical lathe.

There is also a variety of hydraulic broaching machines including Colonial, Oilgear, and LaPointe for transmission gear bores, the Colonial machine used for broaching the serrated bores for the low and reverse gears being one of the largest machines in use anywhere.

Rear bearing retainer housings being produced in this plant are tooled up on new and interesting Natco and Greenlee drilling machines with drum-type fixtures for handling the work in various positions designed to complete all drilling operations in different planes in the same machine. The Greenlee machine, for example, is a horizontal and angular multiple spindle arrangement with hydraulic feed drilling and lead screw tapping attachment. It consists of one self-contained horizontal unit carrying a 15-spindle drill head and one milling head, one single-spindle tapping unit, one five-spindle



Sequence of Major Operations — Buick 40 Flywheel Housing Upper

Rough mill case & transmission side
Finish mill case side
Drill & ream two dowel holes
Drill all holes in frt. & rear end & hand hole pad. Drill & ct' bore trans. pilot hole.
Burr all drilled holes
Mill & chamfer arms
Drill holes in bottom end of arm & clutch yoke pad. Burr holes drilled in this oper.
Drill 3/16 hole near hand hole pad
Bore & chamfer trans. pilot hole
Bore starter hole
Tap holes in end of arms, bottom face & clutch yoke pad
Tap holes in frt. & rear ends & hand hole pad
Inspect

48 in. Cinn. Duplex Mill
48 in. Cinn. Duplex Hydromatic Mill
24 in. Cinn. Drill Press

Foot-Burt 3-Way Drill
48 in. Cinn. Duplex Auto Miller

Foot-Burt 3-Way Drill
No. 2 Avey Drill
24 in. Bullard Vertical Lathe
24 in. Cinn. Drill Press

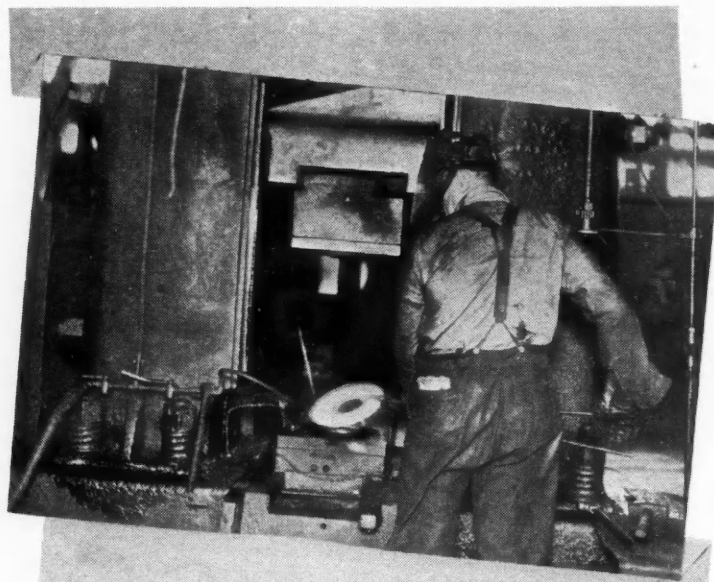
Foot-Burt 3-Way Tapper (16 spdl.—
14 used on this oper.)
Foot-Burt 3-Way Tapper (18 spdl.—
17 used on this oper.)

● Forging the Buick crankshaft on this huge 12,000 pound Chambersburg steam hammer.

● ● Indexing crank throws on 600-ton Chambersburg hydraulic setting press.

tapping unit, two single spindle rack feed drill units, and a nine position automatically indexing turret, each position arranged with two holding fixtures. It is rated at 70 pieces per hour at 80 per cent efficiency.

For machining the housings, cemented-carbide tools are used on all opera-



6000-lb. Alliance hammer used for forging ring gear blanks.

more accurate control of temperatures and much greater productivity. Using this furnace, the work is fed through its cycle automatically and then lower-

tions including the milling cutters on the Cincinnati milling machines.

The most recent equipment introduced in this department is a battery of Inco lapping machines for finishing transmission gears for the Series 60 and 90.

To control the quality, accuracy, and tooth profile of the transmission gears, new set-ups, as well as all changes due to the replacement of cutter and tools during the course of production, are checked in the gear lab. The equipment used for this purpose is of the character of master checking devices used for fundamental research as well as in routine inspection. The laboratory is equipped with the following machines:

Buick noise testing machine.
Illinois involute machine.
Illinois lead test contour checker.
Michigan lead checker.
Fellows red liner.
Zeiss size roller.

According to the recent SAE paper by R. B. Schenck, chief metallurgist, the Buick transmission gears have been case hardened by means of special cyanide equipment which has been used by Buick for some years. However, they are now testing a new and preferred process offered by the Holcroft & Co. gas carburizing furnace, producing a case of 0.002 to 0.005 in. The advantage of the new method lies in

Sequence of Operations—Buick 40

Rough Bore Main Brg. Holes, Large Hole to 4.048-4.052 in. Small hole to 2.820-2.824 in. Semi-finish line ream main brg. hole Rr. hole to 4.057-4.058 in. frt. hole to 2.829-3.30 in.	Greenlee 2-Way Horiz. Hydr. Boring Mach.
Spotface main brg. boss inside on frt. end to .670-.685 in. dim.	28 inc. Aurora Drill Press
Rough & finish mill frt. & rear ends leave .020 in. stock to finish turn	24 in. Cinn. Drill Press
Chamfer main brg. hole in front & rear end of case	No. 2-B Davis & Thompson Drum Type Mill
Broach slot	21 in. Cinn. Drill Press Super Service
Finish line ream main brg. holes large hole to 4.062-4.063 in. small hole to 2.8344-2.835 in.	No. 3 Oil Gear Broach
Finish face front & rear ends of case to O. A. length.	24 in. Cinn.-Bickford Dr. Press
Summary: Drill & tap all holes.	12 in. Monarch Lathe
1st Position	17x5 in. LeBlond Lathe
Load	Natco Two Way Comb Drill & Tapping Mach.
2nd Position	
Left Head-Frt. End. Drill (3) 17/32 in. & (1) 1/2 in. holes in flange. Drill (2) 11/16 in. holes for shifter rail & (1) 51/64 in. C'shaft holes	
Right Head-Rear End. Drill (2) 11/16 in. shifter rail holes (1) 51/64 in. C'shaft hole & (1) 15/16 in. clearance hole	
3rd Position	
Left Head-Frt. End. Drill (5) letter "G" (.261) holes in frt. end	
Right Head-Rear End. Drill (4) Letter "U" (.368 in.) & (1) 5/16 in. holes in rear end	
4th Position	
Left Head-Frt. End. C'sink (5) Letter "G" holes in frt. end	
Right Head-Rear End. C'sink (4) Letter "U" holes in rear end	
5th Position	
Left-Head Frt. End. Tap (5) 5/16-18 in. holes in frt. end	
Right Head-Rear End. Tap (4) 7/16-14 in. holes in rear end	
6th Position	
Left Head-Frt. End. Drill (2) 35/64 in. holes for shifter rails	
Right Head-Rear End. Drill (2) 35/64 in. shifter rail holes. Drill (1) 51/64 in. hole thru idler shaft boss	
7th Position	
Left Head-Frt. End. Ream (1) hole in flange to .531-.532 in. (2) Rail holes to .601-.602 in. (1) C'shaft hole to .8375 in. in frt. end	
Right Head-Rear End. Drill (1) 51/64 in. hole thru 2nd idler shaft boss. Ream (2) rail holes to .601-.602 in. (1) C'shaft hole to .8415 in. in rear end	
8th Position	
Left Head-Frt. End. Chamf. (4) Flange holes (2) Rail Holes (1) C'shaft holes	

Greenlee special machine for drilling and tapping all holes in transmission rear bearing retainer.

ed into a quenching tank located immediately at the exit end. The first furnace is now in experimental production and eventually will be augmented



Transmission Case

Right Head-Rear End. C'bore (2) Rail holes for welch plugs, chamf. idler & C'shaft holes & (1) 5/16 in. oil holes in rear end

Ream idler shaft holes to .327 in. dia.

Drill 47/64 in. & Tap 1/2 in. pipe tap oil filler hole in side of case

Semi-Fin. & Fin. line ream idler shaft & C'shaft Holes Rgh., Semi-Fin. & Semi-Fin. Ream Rail Holes

Rgh. & Fin. Mill Cover Face

Summary Location "A" Load case in fixture to drill, spotface c'sink & tap holes in both sides of case. Remove from fixt. & reload in loc. "B" to drill c'sink & tap tapped holes in cover face & bottom also ream (2) .378-.382 in. holes in cover face

1st Position

Load in Loc. "A" for (1) revolution unload & reload in Loc. "B" to comp. cycle

2nd Position

Location "A" Left Head-Side Drill letter "O" Hole in lock screw boss

Right Head-Side-Idle

Location "B" Left Head-Bottom Drill (1) 47/64 in. Oil drain hole in bottom Right Head-Cover Face Drill (5) Letter "O" holes & (2) 23/64 in. holes in cover face

Right Head-Cover Face

3rd Position

Location "A" Left Head Side. C'sink (1) idler lock screw hole in side

Right Head-Side-Idle Location "B" Left Head-Idle

Right Head-Cover Face C'sink (5) letter "O" holes & ream (2) 23/64 in. holes in cover face

4th Position

Location "A" Left Head-Side. Tap (1) 3/8-16 in. hole in idler lock screw boss

Right Head-Side-Idle

Location "B" Left-Head-Bottom. Tap

(1) 1/2 in. Pipe Tap oil drain hole in bottom Right Head Cover Face. Tap (5)

3/8-16 in. Holes & c'sink (2) .378-.382

holes in cover face

Mill idler shaft bosses inside of case

Mill C'shaft Bosses (inside) on frt. & rear ends

Line ream rail holes

Brush file & blow out outside of case & remove burrs

Inspect

One-Way Millholland Mach.

24 in. Cinn.-Bickford Super Serv. Drill Pr.

W. F. & John Barnes Reaming Mach.

No. 2-B Davis & Thompson Drum Type Mill Mach.

Natco Comb. Two-Way Drilling & Tapping Machine

No. 3-24 in. Cin. Hydr. Millers

No. 3 24 in. Cin. Duplex Mill Mach.

Bench & Motor Driven head

Bench

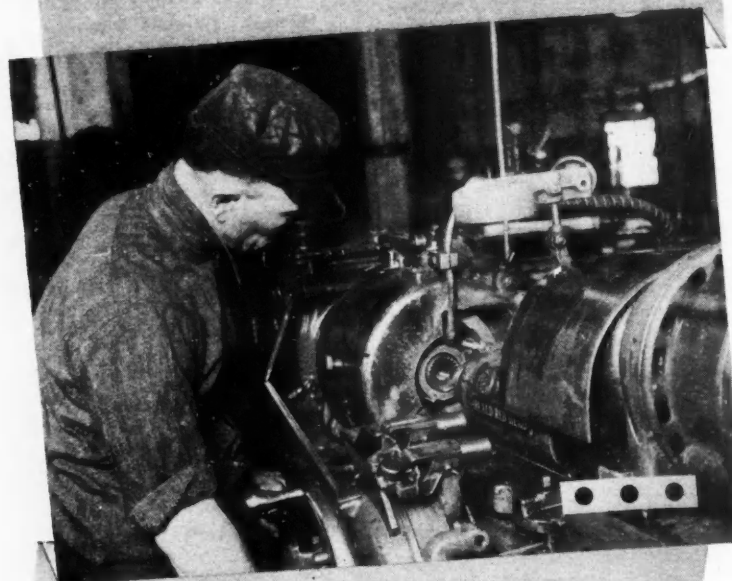
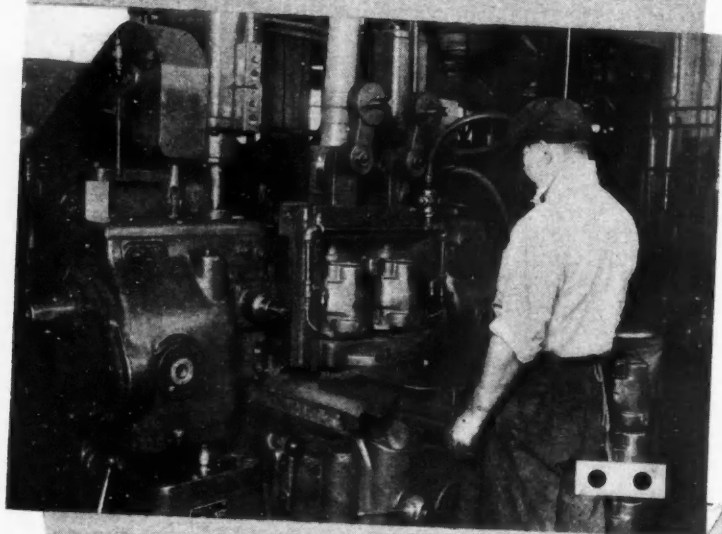
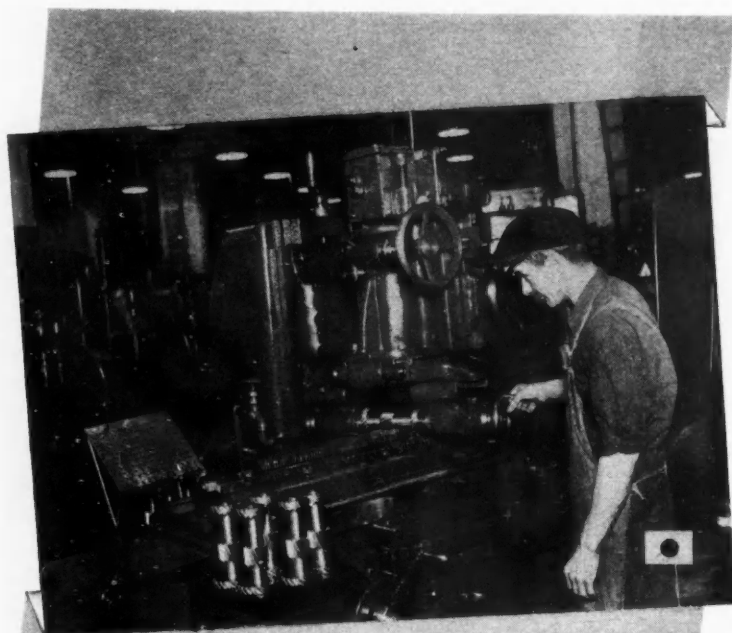
Bench

by two other units, the small battery having sufficient capacity to handle the entire volume of Buick production.

One of the interesting spots in this department is the corner devoted to the machining of gear shift forks. A Cincinnati Duplex vertical hydraulic broaching machine is used to handle the broaching of two operations—throat and shifter slot—on both the first and reverse shift yokes, in the same machine. The yokes are mounted in pairs on two fixtures on the indexing table, handling four pieces at a time. In each pair, one broach finishes the throat while the other takes the slot in the hub. Each piece is chucked twice to complete the operation. Stock removal is about 1/8 in. plus the allowance for draft. Surface speed of the ram is 20 ft. per minute.

Curtis air hoists are used at a number of points in this plant but there is nothing more tricky than the installation at the Cincinnati broaching machine. Forks are brought to the machine in a large tote box, and to simplify handling, the station is fitted with a Curtis air hoist carrying a powerful electromagnet at its extremity. The magnet is dipped into the box and a large number of forks lifted right up to the operator's station some distance above floor level.

An important feature of the department is a combination chip conveyor and exhaust duct system mounted at



the ceiling and communicating with each machine. It draws all chips and filings by suction into the large main duct and then transports the accumulation of metallic chips to the salvage station.

Space does not permit of more than passing reference to the high spots in this department. To give you a better impression of at least a cross-section of activity we have appended complete factory routings on the following representative parts—transmission case, shifter forks, rear bearing retainer, and the clutch gear. The routings are supplemented by photographs of some of the equipment mentioned above.

Axle Machine and Assembly

This department takes care of the assembly of front and rear axles, machining of front axle parts and rear axle housings, machining and assembly of propeller shafts, and the machining of wheel hubs. In addition, the department is provided with forming machines and welding heads for the fabrication of welded tubing for tail pipe, fillers, etc., as well as large diameter tubing for muffler shells.

Tail pipes are formed, welded, and then bent in various shapes on a battery of Toledo presses equipped with suitable bending fixtures which handle many rather difficult bends without the aid of filler material in the tube.

Probably the first thing that greets the eye is the overhead monorail conveyor feeding the front axle—independent suspension—assembly. The entire line along this side is devoted to the front and rear axle assembly stations, providing an interesting panorama of overhead feeder lines and assembly conveyors with their multiplicity of stations.

Among the machining operations that

● Shaving cluster gear tooth profile on Michigan gear shaver.

● ● Cincinnati Hydromatic Duplex mill used for facing countershaft bosses inside on front and rear ends of case, using c-t-c tipped milling cutters.

● ● ● Heald Sizematic for grinding bore of clutch gear.

would attract immediate attention are the set-ups for the steering knuckle support and the lower arm assembly. The former is handled on a Baker drill with a six-place indexing fixture for drilling, counterboring and reaming. Its interest lies in the physical size of the parts and the attendant difficulty of handling them economically and within the close manufacturing tolerances demanded at this point. The lower arm assembly is another of the large parts and it takes certain drilling operations on a big Natco driller provided with a barrel-type fixture.

In the production of propeller shafts, the forged ends are machined completely, pressed into the steel tubes, and then welded integrally on a special welder. As a final operation the assembly is checked for balance of a new G.M.R. balancing machine with a scale similar to that used on the G.M.R. crankshaft balancing machines.

Wheel hubs are practically completed on two large Bullard six-spindle machines, the only operations requiring special handling being the reaming of the large bearing bore on a Kokomo drill press, reaming the small bearing bore on a 24-in. Cincinnati drill press, and tapping five 9/16 holes on another 24-in. Cincinnati with a tapping attachment. A feature of the Bullard set-up for the Model 60 front hub is a drilling attachment at the sixth station, first operation. This takes five 9/16 holes and three 21/64 in. holes within the brief interval of time permitted in the cycle of the machine. It is quite likely that future tooling may also incorporate a head for tapping the holes so as to eliminate an extra handling.

High spots of the department, illustrating some of the equipment as well as the assembly lines, will be found in the pictorial section.

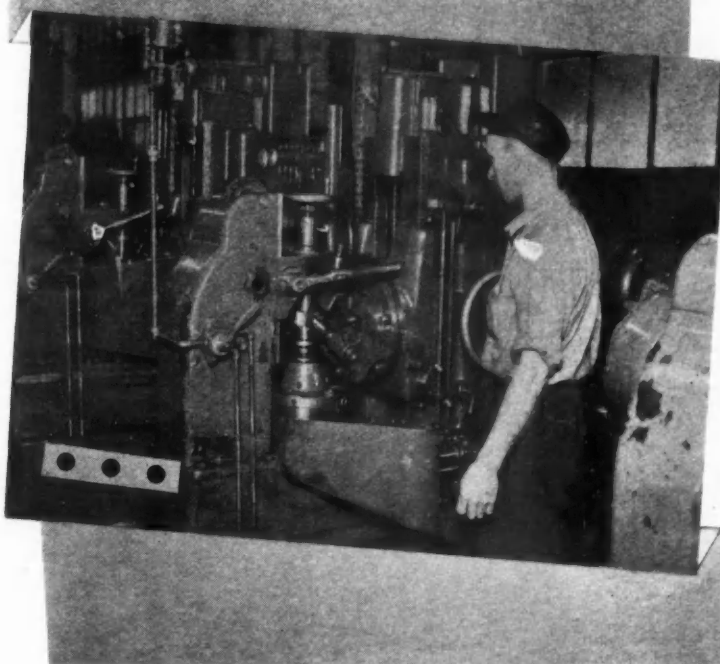
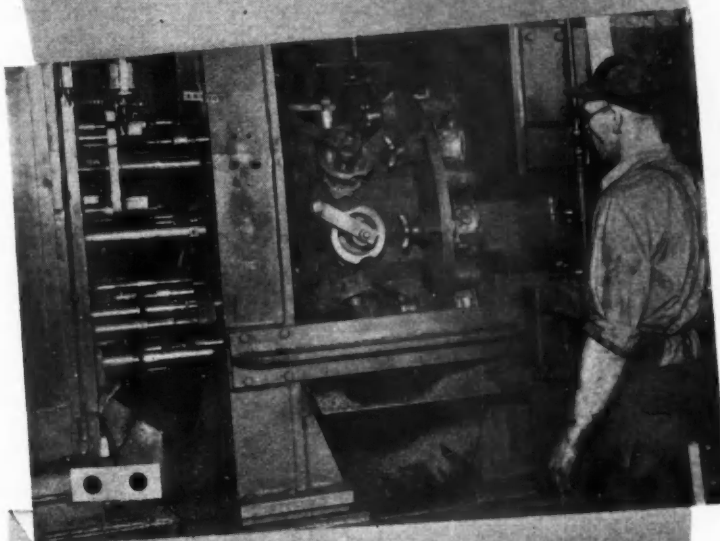
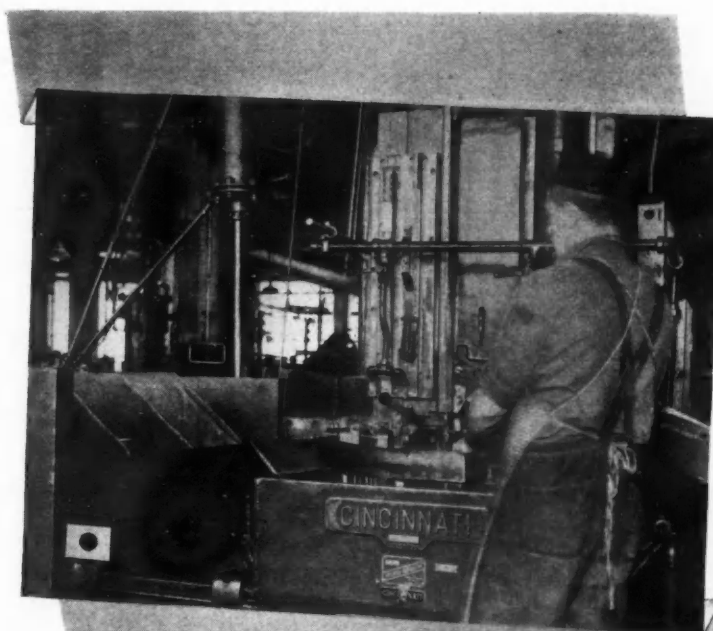
Stamping Division

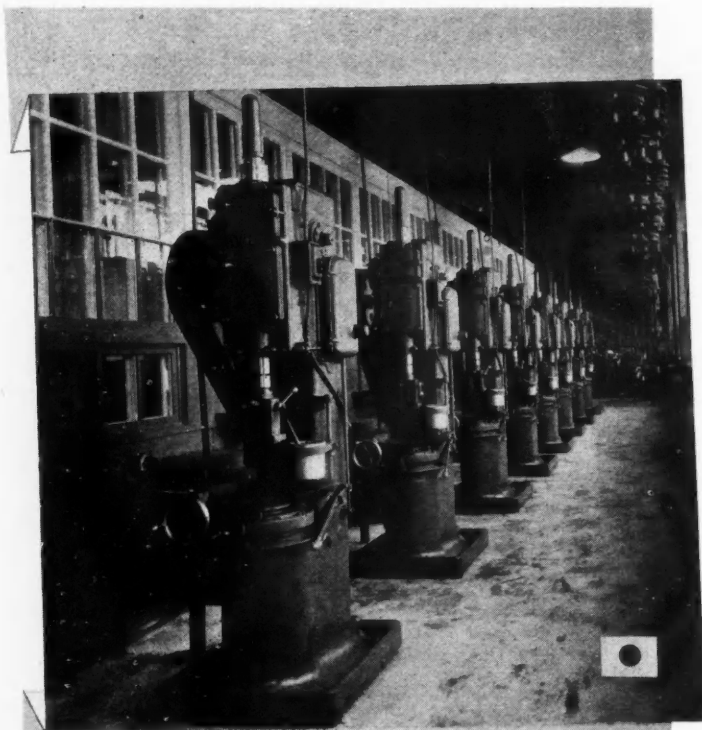
A visit to the stamping division is

● Cincinnati Hydro-Broach, Duplex Vertical type for broaching throat and shifter slot in first and reverse shift yokes. Note Cutis air hoist in background, provided with electromagnet for feeding forks to machine.

● ● Big five-head Natco automatic drilling and tapping machine for Model 40 rear bearing retainers. Note two-position drum-type fixture handling all holes by re-chucking.

● ● ● Finish-hobbing 14-tooth gear on Gould & Eberhardt hobber.

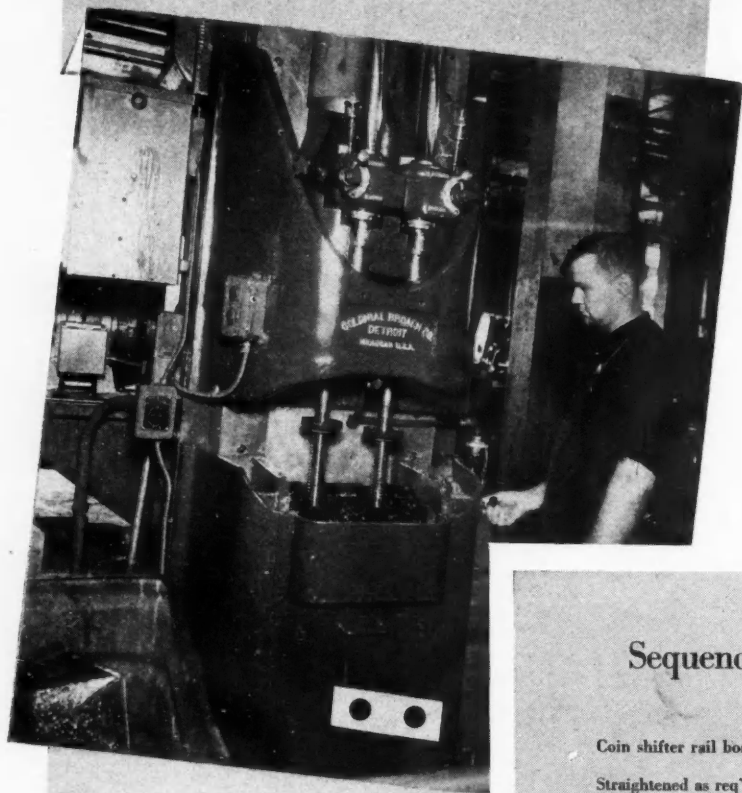




most impressive what with its immense bay of huge presses, the banks of sheet metal, and the great stacks of fender stampings ready for the finishing operations.

One interested in details will not miss the new Gallard-Henning baling machine that takes sheet metal scrap of every variety and size into its massive maw and converts the heap into slugs of uniform size but, of course, of varying density. The baler is set up to produce slugs ranging from 350 to 500 pounds apiece, at the rate of 50 per hour, or a total of around 50 tons per day.

The men in charge here are particularly proud of a new Cincinnati hydraulic shear. It is indeed a handsome machine, compact and clean looking despite the fact that it's a glutton for work and can outdo the big, clumsy affairs which are giving way to the new order of things. This shear has a capacity of $\frac{1}{4}$ in. in mild steel sheet and will run at 60 strokes per minute. Its big-



● View of battery of Inco laps for finishing all gears for large series transmissions.

● ● This Colonial Broach Co. vertical broaching machine is one of the biggest in the industry. Operation shown is broaching 24-tooth involute spline in bore of low speed gear at rate of 197 per hour. Spiral angle of spline produced by lead of pull bars shown at upper part above fixture.

Sequence of Major Operations First & Reverse Shift Yoke

Coin shifter rail boss & fork faces

Straightened as req'd
Broach throat
Drill rail & lock wire holes & ream rail holes.
Drill, ream & tap lock screw hole
Broach throat & shifter slot
Grind sides of pads
Mill chamfer on shifter pads
Remove burrs from slot
Polish pads
Heat treat

Metallurgical inspect
Inspect

No. 664 Toledo Knuckle Joint Press
No. 167½ Hamilton Press
Bench
Cinn. Duplex Vert. Broach

Kingsbury Drilling & Reaming Mach.
Cinn. Duplex Vert. Broach
No. 220 Badger Grdr.
No. 1 Kent-Owens Hand Mill
Black & Decker Grinder

Cyanide Furnace & Water Tank, Air
Hoist Wash Tank & Oil Tank
Hyd. Test Mch. & Bench Grinder
Bench

gest appeal lies in the tremendous speed of operation coupled with extreme precision since the size of the work is controlled by an automatic gage which is adjusted with greatest facility. When this shear is supplemented by two more of its brothers it will displace a whole row of the old-fashioned machines now in use.

A number of new Henry & Wright dieing machines with automatic roll feed also have been installed recently. These machines have made a great reputation here for the facility with which they handle the progressive blanking and stamping of washers and other small stampings.

Two big Clearing presses will be found at work on the production of brake drums. One machine does the forming, the other perforates the web or wheel side. This is a set-up demanding great pressure coupled with a high order of precision.

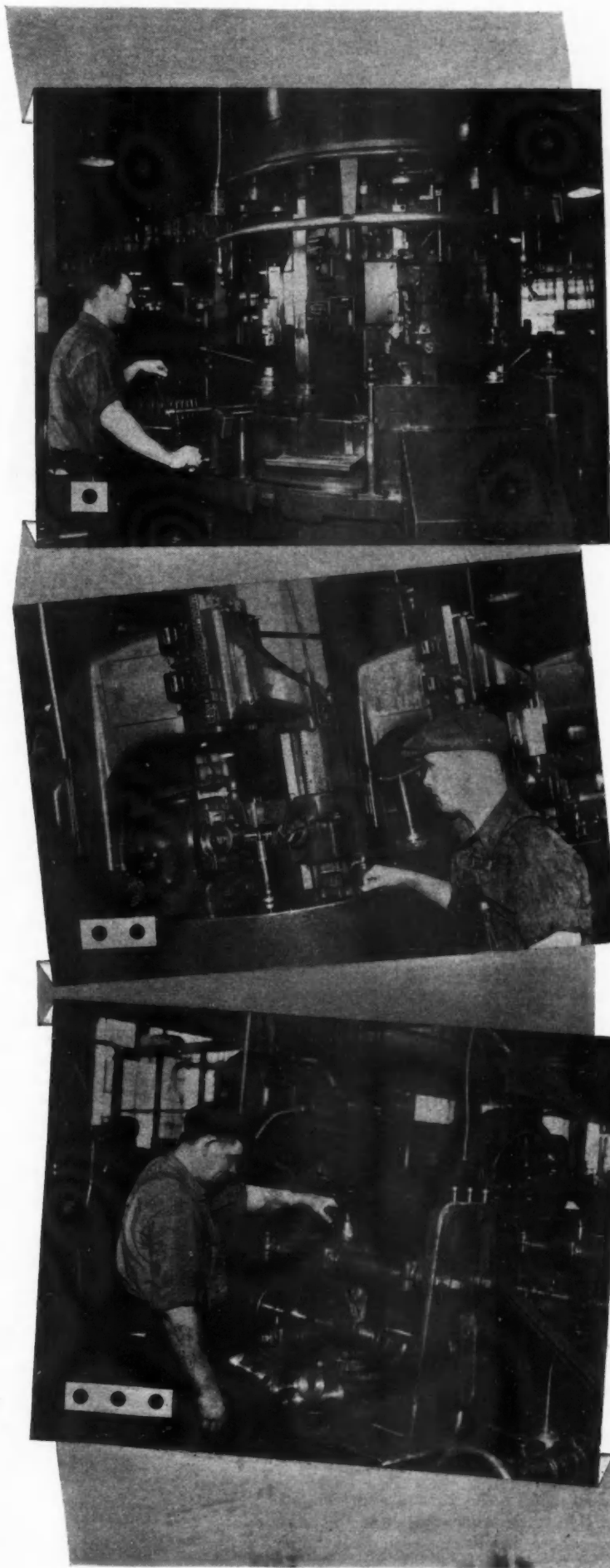
The most attractive single set-up in this department is the group for producing the huge one-piece front fender stampings. The sequence of operations briefly is as follows—blank first, then a pass through the stretcher rolling machine to relieve stretcher strains. First draw on the huge Hamilton double-action press is followed by a re-strike on a Toledo press. The latter has two separate dies set up on the bed—one for the front end, the other for the rear end of the fender. Final operations are completed in an unusual trim die set-up in a Toledo press. This press has four different dies and, of course, four different fenders in the works at each stroke. These die stations take care of the trimming details at four points.

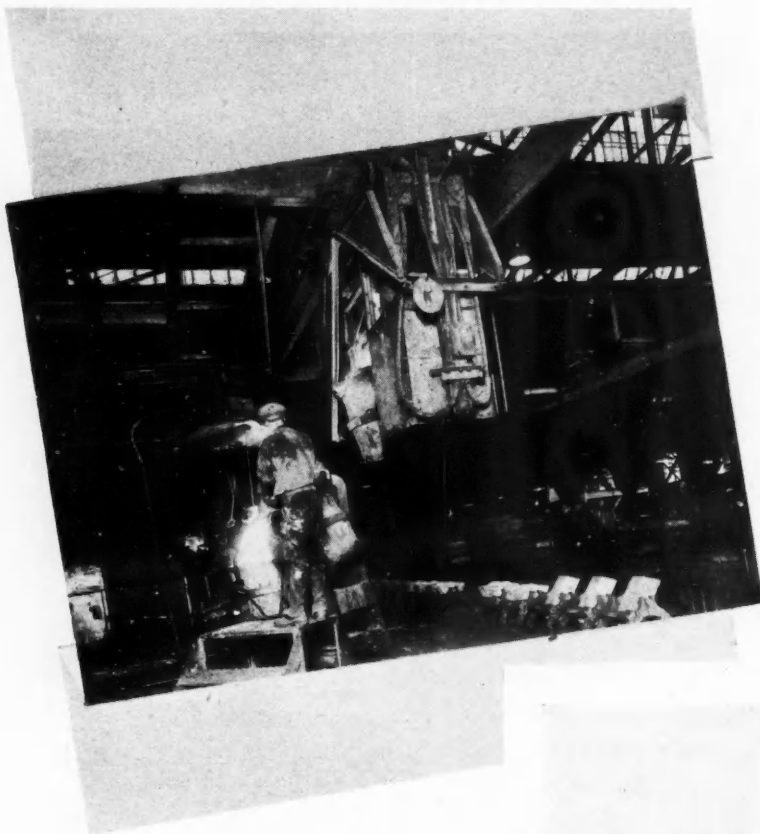
The scope of the operations in this department will be better appreciated with the aid of selected views in the pictorial section.

● Finish-turning gear end complete on Model 40 clutch gear on 8-station, 8 in. Bullard Mult-Au-Matic.

● ● Spline end of clutch gear shaft produced by hobbing on one of battery of Cleveland hobbing machines.

● ● ● Rough-hobbing 14-tooth gear on Barber-Colman hobbing machine.





Receiving ladle for metal distribution in Buick foundry.

wheel alignment are handled simultaneously. The headlamp machine is a massive adjustable frame carrying the adjustment equipment, consisting of

Final Assembly

Details of the final assembly department are best disclosed by examining illustrations at several strategic points in the pictorial section. However, this department has many novelties well worth noting.

In the first place, the assembly department really consists of two different buildings about at right angles to each other. Frame and running gear assembly takes place in one building and then the assembly line swings around the corner in a big arc continuing over the final stages. At the corner where the line bends we find pits in which the operators can conveniently complete underbody fastenings, adjustments, etc.

A few stations ahead of the bend in the line, the entire front end sheet metal assembly is lowered onto the chassis, and then the body is installed. The front end assembly is made up on the floor above and is lowered as a unit through an opening in the floor.

Just before the cars are driven off the line, they stop at an unusual station where headlamp adjustment and

Sequence of Major Operations—

Center both ends

Rough turn $1\frac{1}{8}$ in. dia. to 1.158-1.146 in.
Rough turn .602-.609 in. dia. to .639-.627 in. Rough turn OD. of spline to 1.252-1.278 in. Rough turn 1.413-1.418 in. & turn thd. dia. to 1.416-1.428 in.; rough turn 1.228 in., 1.230 in., 1.252-1.278 in. Face $2\frac{1}{4}$ in. shldr. at end of gear blank

Finish turn to .602-.609 in. dia. Finish OD. of splines to 1.223-1.228 in. Finish turn 1.3773-1.3778 in. dia. to 1.391-1.396 in. Finish turn $1\frac{1}{8}$ in. Finish turn 1.228-1.230 in. to 1.240-1.245 in. Undercut pilot to .569-.579 dia. Face shldr. at $2\frac{1}{4}$ in. dia. Face spline dia. to lgth.; chamfer pilot & spline dia.

Finish turn gear end completely

1st Station. Load

2nd Station

Rough c'bore in cone dia.; rough turn cone & gear dia.

3rd Station

Core drill brg. hole to fill depth; rough sweep cone dia.

4th Station

Rough face rear side cone; rough recess between cone & gear; finish recess at bottom of c'bore

5th Station

Finish bore brg. hole; finish bore c'bore; chamf. brg. hole $1/16 \times 90$

6th Station

Finish face rear side of cone; finish face front side of gear; chamfer c'bore ($1/32 \times 45$ deg.)

7th Station

Finish recess at bottom of brg. hole, chamfer, frt. side of cone $3/64 \times 45$ deg. chamfer frt. side of gear

8th Station

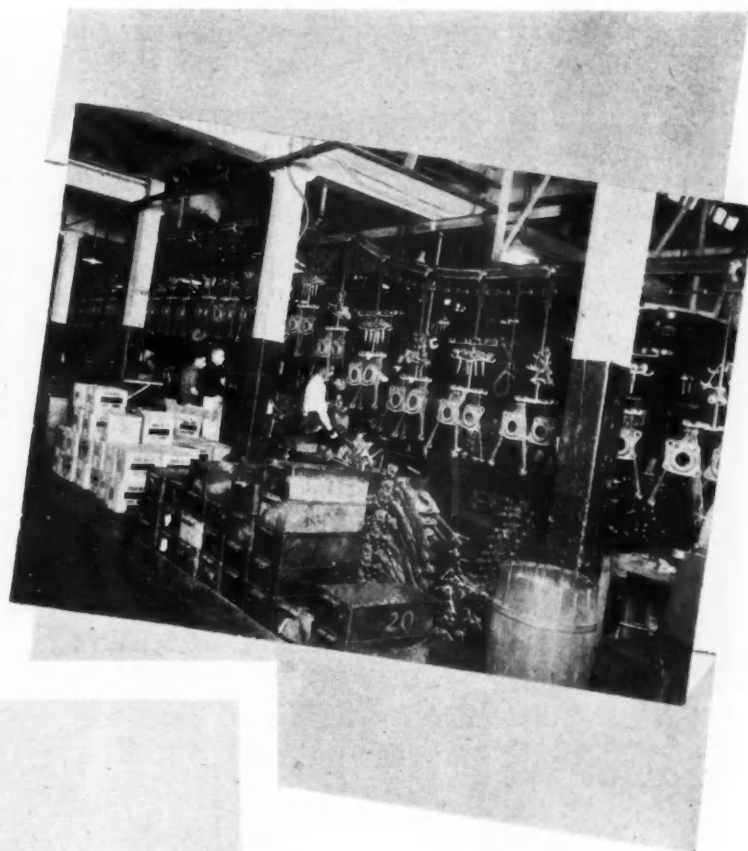
Finish ream brg. hole, finish turn gear dia., chamfer rear side of cone $3/64 \times 45$

Cadillac Centering
Fay Auto Lathes

Fay Auto Lathe

8 in. 8-Stat. Bullard Mach.

Flow of parts and sub-assemblies along the front axle assembly line which starts in the foreground and extends rearward.



two sets of condensing lenses, movable on a cross-bar. The entire machine is wheeled right to the lamps for making the final adjustment. We understand

Buick 40 Clutch Gear

deg., chamfer rear side of gear turn groove on rear side of cone
Burr hole

Drill $\frac{1}{8}$ in. lock wire hole
Burr $\frac{1}{8}$ in. lock wire
Drill (2) $\frac{1}{8}$ in. oil holes
Cut 1-3/8-16 in. ANF. Thd.
Cut oil return groove
Burr ctrs. & ream burr from brg. hole
Shape (24-Teeth Int.)
Chamfer 24-Teeth int.
Rgh. & finish hob. (10) key spline
Finish hob 17-Teeth
File all burrs & rd. ends of ext. teeth
Grind stem dia. $\frac{1}{2}$ in. long next to oil groove for indicating when straightening
Shave 17-T gear
Inspect (gear lab.)

Check involute
Check lead
Inspect for noise & bearing
Heat in 40% cyanide
Quench in oil
Draw
Straighten
Metallurgical inspect

Impact
Polish large center
Polish small center
Grind pilot dia. to .5895-.590 in.
Brush scale from gear teeth & rgh. grind hole dia. to .9935-.9955 in.
Grind hole dia. to 1.000-1.001 in.
Grind oil groove dia. to 1.227-1.229 in.
Grind brg. dia. to 1.3773-1.3778 in.

Rough and finish grind taper
Final inspection
Lap 17-teeth
Wash to remove lapping compound

Bench No. 14 Ingersoll-Rand Air Mtr. (one air Mtr. req'd for ea. mach. at oper. No. 70)
Avey 3-Spdl. Drill Pr. 194
Avey 3-Spdl. Drill Pr.
Avey 3-Spdl. Drill Pr.
Hanson-Whitney Thd. Miller
Lodge & Shipley Lathe
Bench
Fellows Shaper
Lipe Tooth Chamfer Mach.
No. 12 B. C. Hobbing
Clev. 8-Spdl. Rotary Hobbing Mach.
Spec. Gear Tooth Burring Mach.
No. 2 Landis Univer. Grdr.

Mich. Tool Co. Gear Shaving Mach.
Bench. Red Line Mach.
Zeiss Size Mach.
Involute Mach.
Lead Checking Mach.
Bench
Gear Hardening Mach.
Oil Tank
Furnace (Draw)
No. 3 Toledo Press. No. 13 Toledo Pr.
Rockwell Mach. No. 3 Hanson & Winkle Grdr.

Impact Mach.
L & G 2-Spdl. Drill Press
2-Spdl. L & G Drill Press
Landis Grdr.
Heald Size-Matic Grdr.

Heald Size-Matic Grdr.
Landis Plain Grinder
10x20 Landis Hydr. Grinder 6x20 in.
Landis Hydr. Grinder
10x18 in. Landis Hydr. Grdr. Type "C"
Bench
Mich. Gear Lapper
Niagara Washer

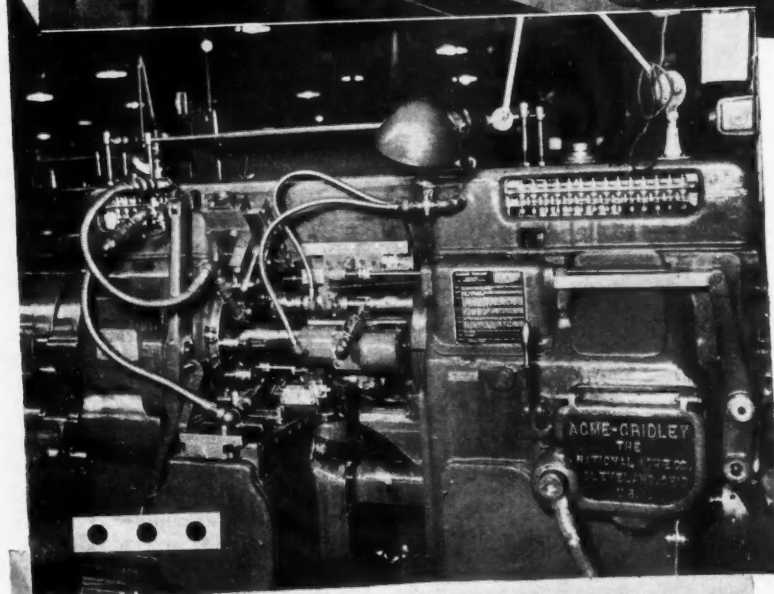
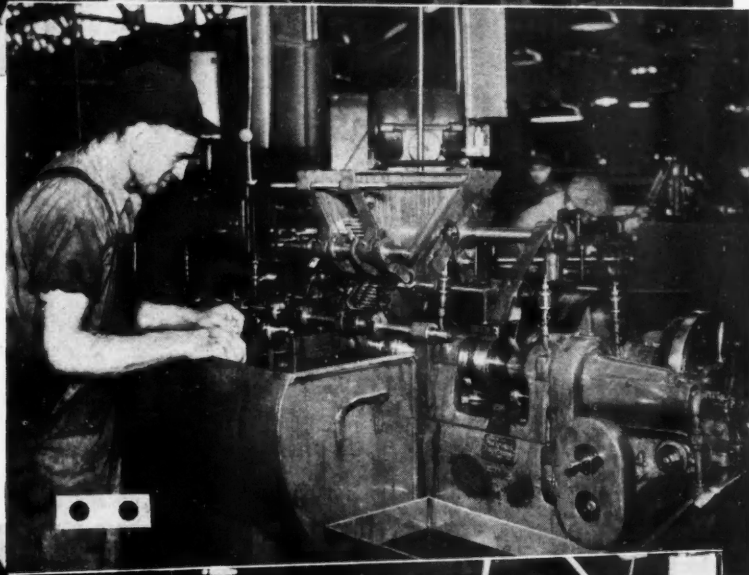
that the device was designed by Buick.

At the same station, there is a pit with the necessary equipment for making accurate adjustment of toe-in and wheel camber. In making the adjustment, the front wheels are fitted into a pivoted section in the conveyor, somewhat like a small turntable for each wheel, and this in turn is connected to recording gages in the pit which show the correction needed for each wheel.

An unusual feature of the final section of the line is the close-coupled effect of the touch-up line directly ahead of the assembly conveyor. This short section is provided with a baking oven for "setting" paint repairs. At the time this article is being written they are completing another touch-up line and oven installation parallel to the present line. To facilitate the routing of finished cars over the touch-up line, a large turntable has been built in the floor close to the assembly conveyor. Cars may be backed on the table, reversed in direction, and then pointed to either of the two touch-up lines at will.

Forge Shop

Under the new setup, the Buick forge



shop has been placed on a more flexible operating basis than formerly, by virtue of new production methods and closer quality control.

Particular attention has been given to closer working tolerances. For instance in the crankshaft line draft angles have been reduced to three degrees. Furthermore the crankshaft forge line and process have been so laid out that billets can be used instead of bar stock.

In production, crankshaft billets are first cut to weight. They then go to the first of two new 12,000 lb. Chambersburg steam hammers for roughing. They are then finish forged in the second Chambersburg steam hammer. Both hammers are fitted with double-admission ports, providing a fast intake of steam at the bottom of the stroke, and resulting in a fast return and elimination of the usual "dwell." Ratio of deadweight in the base to the weight of the ram is higher than usual to increase the anvil effect.

Before trimming off the flash the cranks are partially dipped into a special cooling bath, where the counterweights are partially quenched. This results in preventing any misshaping of the counterweights in the trimmer. Following trim, flywheel flanges are upset at the end of the shaft. Cranks are then twisted to index for the various throws.

When cool, the shafts go to heat treat. After hardening and before quench and drawing, they are "re-

● Pivot screws are turned out on this 26 Brown & Sharpe automatic with a special motor-driven attachment at the operator's left for drilling holes in the head. An arm picks the screws out of the chuck, and carries it to the attachment where the screw is automatically indexed for drilling within the cycle of the machine.

● ● Cleveland automatic with unusual tooling for double-end threading of studs. Pointed studs are fed from the hopper in the center, gripped at the center section in jaws, and threaded—both ends, at the rate of 475 per hour.

● ● ● Every six seconds a valve adjusting ball stud comes out of this National Acme automatic. It completes all forming operations, a flat on end of ball, threaded end, and a slot in threaded end.

struck" in a 360-ton hydraulic forming press.

The quench for the crankshafts also differs from conventional practice. The shafts are not dropped into the quench but are placed on trays which are lowered by a conveyor hoist into the quench tank at a definite rate of speed, so as to reduce quenching distortion.

Die-cost has been materially reduced in the camshaft forge line. Instead of upsetting the end bearing on the shaft—with a high die-replacement—this bearing is now "gathered" in the form of a "ball," in the first half of the forging die. Forming is in the second part of the die, which is also used for re-striking after trimming. The change has resulted in an increase of die life from 9000 pieces to around 29,000 pieces.

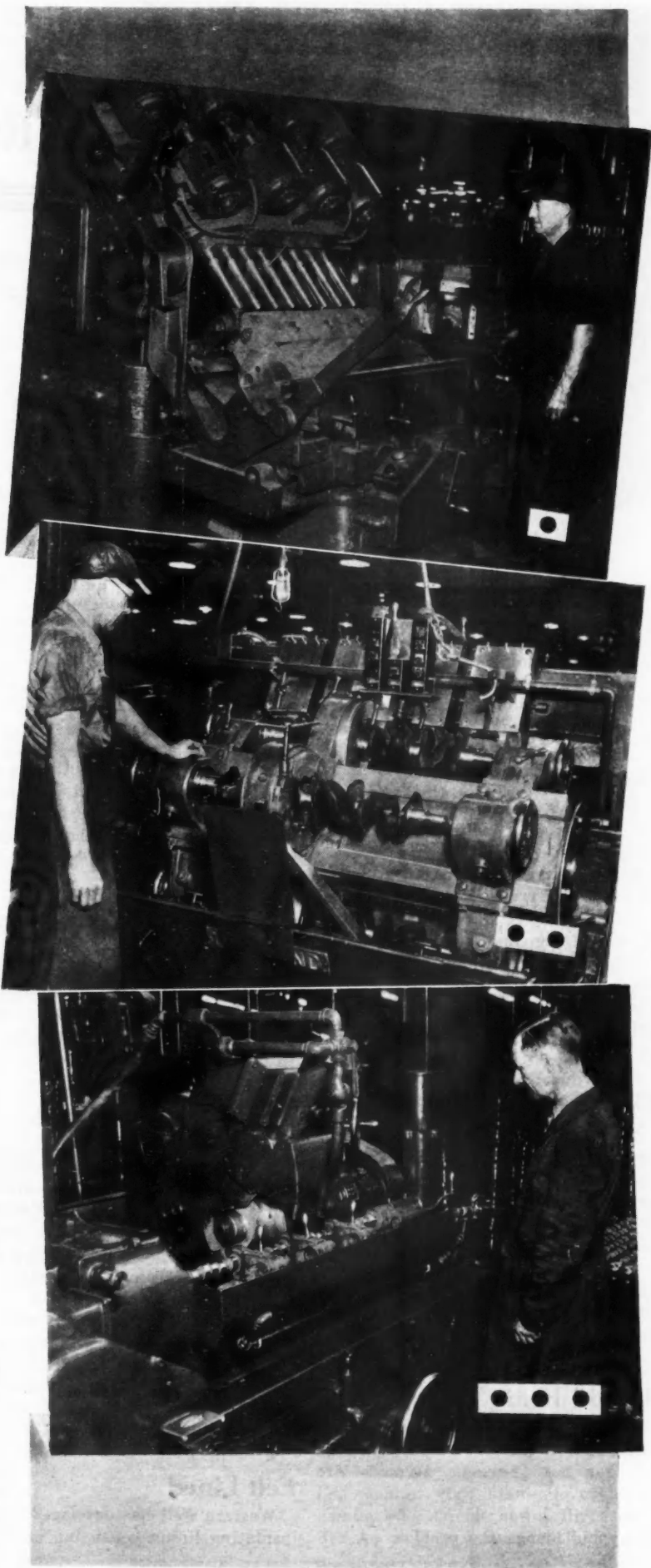
This excursion through the main divisions of the great Buick enterprise will give you some impression of the breadth of activity covered by its manufacturing departments. In the several instances where factory routings are given, one is able to get a still better picture of the manner in which specific problems have been worked out.

Through it all, we hope that we have succeeded in creating some atmosphere of the modernity of the plant as evidenced in its utilization of the latest manufacturing methods and equipment. But over and above this is the definite feeling that under the leadership of H. H. Curtice the course of mechanical progress will never stop at any given point.

● Single point boring of cylinder bores is introduced at Buick. This is an eight spindle Ex-Cell-O machine, each spindle being individually driven. Blocks are loaded in an upright position from the conveyor at the right and then moved into working position by tilting the fixture.

● ● The latest word in crankshaft lathes is this 9ACL LeBlond lathe with three-station turning which divides the cuts between three sets of tools.

● ● ● Landis air-sizing principle tried on grinding of Buick camshaft bearings has worked out so successfully that this new machine was brought in for the automatic grinding of cam contours.





The far-flung double row of automobile units clamped in fixtures traveling on conveyors is made up of Dodge transmissions in process of being assembled by trained mechanics. The conveyors deliver the transmissions to a silence-test room, from where they go to the motor assembly.

PRODUCTION LINES

Ihrigizing

Arthur D. Little's *Industrial Bulletin* for May touches on the new technique of forming a hard protective case on steel by driving silicon into the surface, forming a ferro-silicon case with almost 14 per cent silicon. The process is called Ihrigizing, after the inventor. The treated surface is said to have unusual resistance to heat and wear and successfully resists the attack of acids and the salt spray.

Tide Turns

Many autoplants are already stripping for action on new models. We have been in several recently where comparatively new equipment has been ripped out and is being replaced with special machines for 1937 production. It would not be at all surprising to find that the total capital expenditures in 1936 will hit right close to the big figures published for 1935.

Hypoid Rears

Some oilmen have not recognized the seriousness of the trend to hypoid rear ends for next season. Hypoids are needed to eliminate body tunnels and permit still lower floors. To oilmen the hypoid brings the problem of E-P

lubrication, which evidently has not yet been solved as a general rule, although a few specialists seem to have made fine headway during the past year or so. Don't overlook the big E-P demand for 1937.

Safeguard

A new wheel guard for passenger cars and trucks is on the way and may be ready for the market within 60 days. This is a vital factor in effecting safety in the event of tire failure.

For Belts

Air-acetylene flame has been proved very successful in splicing power belting. Its principal virtue lies in the ability to greatly cut the time required for doing the job. Belting is prepared for splicing in conventional fashion and then the layers are coated with balata gum cement. The two ends are joined, pressed flat in a press, and the entire surface subjected to the flame. In the case of 8-in. belting, the flame is applied for about five minutes.

Felt Lined

Western Felt has developed a unique insulating lining consisting of a thick-

ness of fine wool felt to which is adhered a facing of artificial leather. The leather facing is available in a variety of grain patterns and colors to match any kind of decorative scheme. This lining seems to be particularly well fitted for use in truck and commercial cab interiors, not only because of the handsome finish, but especially because of its role as a sound and heat insulator. Recently a number of house-type trailers have been built using this lining over a layer of $\frac{3}{8}$ in. white felt for additional insulation. Here is something that's well worth investigating.

For 1937

So far as we can see at the moment the 1937 cars will be no more radical than we recently pictured in *Automotive Industries*. Very little change is expected either mechanically or in body construction. However, there are many refinements that may be suggested. One chief engineer tells that the biggest refinement would be the elimination of the gear shift lever—page Bendix—and certainly the elimination of body tunnels. Along this line, we believe that certain cars will have either hypoid or "cone" worm gearing to lower the axis of propeller shafts.

Molded Retainers

Have you seen the new molded retainer ring construction for ball bearings? See *Durez Plastic News* for April for a brief description. If you want more, we can get the details.

J. G.

MANUFACTURING
MANAGEMENT
METALLURGY

Just Among Ourselves

Summer Meeting Full of Plus Values

THE Summer Meeting of the S. A. E. just past was unusually rich in papers and discussions of a provocative nature. From the opening session at which Walter Fishleigh according to some people threw a lariat around future engineering, and according to others supplied a needed stabilizer, conflicting ideas rebounded with the speed, click and precision of a ping-pong ball in tournament play. Attendance at most sessions was quite good, for which, we believe, two things were responsible in addition to the excellence of the technical program set up by the S.A.E. Meetings Committee headed by Col. H. W. Alden of Timken. One of the plus values was the technical demonstrations of which the slow motion pictures of knocking and non-knocking engine explosions, presented by Lloyd Withrow and Gerald Rassweiler of General Motors Research, and the driver reaction tests conducted by Dr. H. R. De Silva, of the Harvard Bureau, drew special plaudits.

Another line of interest was the daily program developed by S.A.E. headquarters which gave last minute information about unavoidable changes in program, and added events. There wasn't anything on the program in the lighter-than-air field, but in a conversation on the subject with Neil MacCoull, who like most people who have worked in the field, believes that we have failed to take full advan-

tage of airship possibilities in the United States. The possibilities are so good, he thinks, that private capital will probably go ahead with airship developments if the government follows out its apparent tendency to stop further development work.

Superchargers For 1937 Models

SUPERCHARGERS may appear next season on a car in the upper bracket of weight and price class, and hydraulic valve-lifts will probably be found on at least one additional car in 1937. There was considerable interest in both these components at the S.A.E. meeting, and discussion of the Memorial Day Race at Indianapolis, fresh in the minds of many engineers who came to White Sulphur via the speed classic, centered on fuel economies forced by the limitation on fuel used during the 500 mile event.

Diesels to The Front

THE announced general theme of the meeting, "engineering for safety and economy in automotive transportation" drew many people whose jobs are concerned with the legislative and educational aspects of the subject, including Alfred Reeves, general manager of the Automobile Manufacturers Association. A legislative side-light which illustrates the intimate connection between the

automotive industry and all forms of legislation affecting transportation was the expressed belief (multiple) that two-cent rail rates may force a lot of bus operators to install Diesels, in order that they might be able to operate profitably on bus rates of, say, 1.75 cents per mile.

NORMAN NAIRN of the Nairn Transportation Co. which pioneered a desert bus route from Damascus to Bagdad placed an order for 10 Diesels just before arriving at the S.A.E. Meeting.

The Noise Problem Up

AN interesting fact and an interesting possibility came out of the discussion at the Chassis Session. The first was the acoustical engineer's statement that cars which gave satisfactory noise qualities in various cities developed objectionable noise characteristics when operated in Detroit. No complete explanation came out as the reason for this condition which has been named the "Detroit effect" by the men responsible for its discovery. In the heat of discussing the characteristics of objectionable noises in vehicles, one speaker suggested that perhaps more would be accomplished if attention were turned to the possibility of servicing roads in a way that would reduce or ameliorate the noises appreciable to drivers passing over them.—H. H.

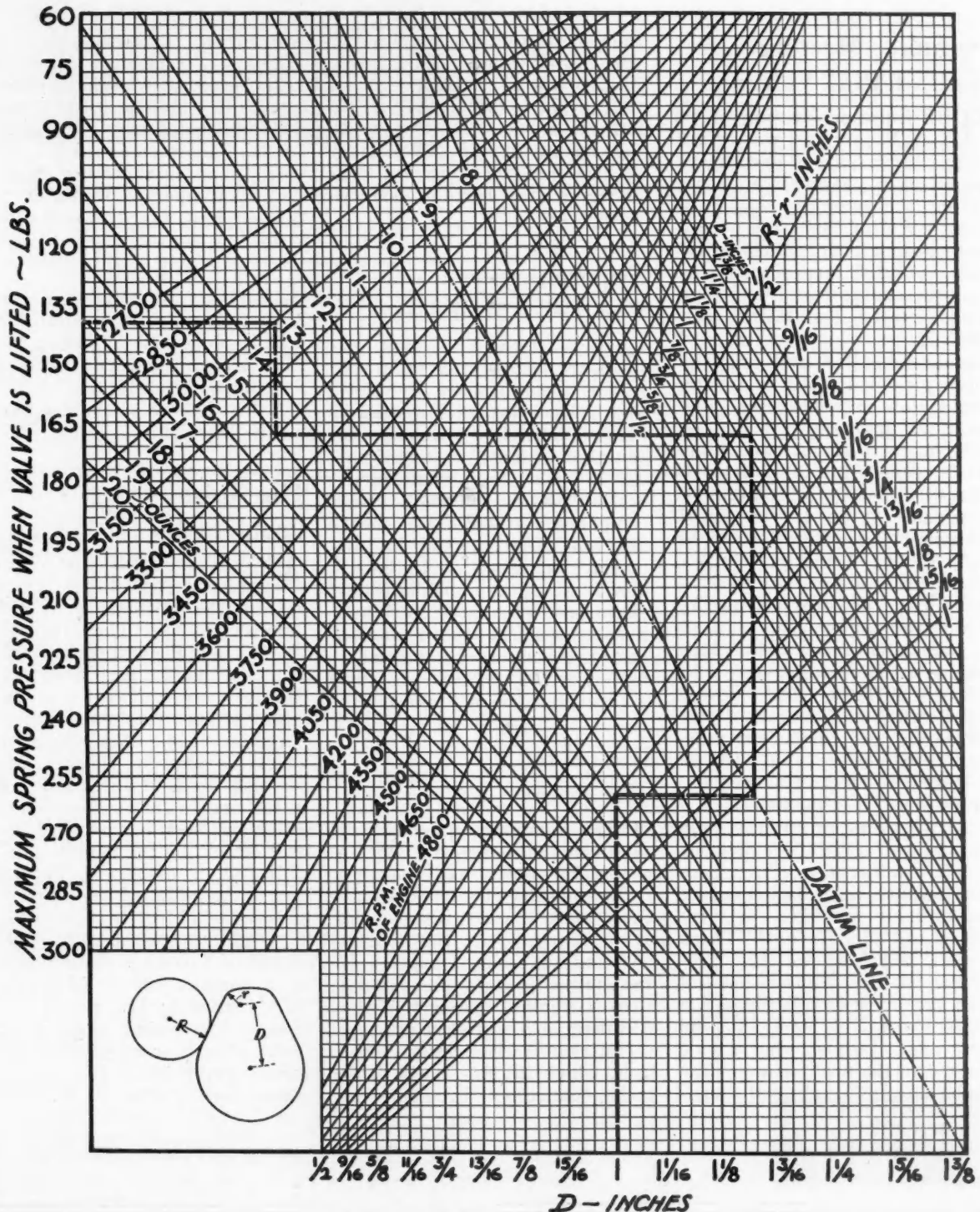
Valve-Spring Pressure Required With Tangential Cams

(Automotive Industries Engineering Chart Redrawn to Cover a Wider Speed Range)

THE chart gives the minimum pressure which the spring must exert when the valve is lifted, in order to keep the follower in contact with the cam at the particular speed. It is used as follows: Start from the point on the bottom scale denoting the

distance D between the centers of the base circle and the rounding circle of the cam, proceed upward to the inclined line representing the value $R+r$ (see sketch), then horizontally to the Datum Line, then upward to one of the parallels representing the distance

D , then to the left to one of the inclined lines representing the weight of the valve reciprocating parts, then up or down to one of the inclined lines representing the maximum engine speed, and then to the left scale, where the pressure required may be read.



Meyer's Third Victory

(Continued from page 782)

heat by mica at the combustion chamber end. A cold-rolled steel electrode conductor is screwed into the copper electrode to reduce the heat flow into the wiring.

However, as previously mentioned, engines gave relatively little trouble during the race. In addition to Fred Frame's cracked piston, Billy Winn burned a rod and McGurk broke a crankshaft. It is interesting to note the increased popularity of the especially designed racing engine. Of the 33 cars to face the starter's flag, only one, Zeke Meyer's Boyle Products Special, originated in a passenger car factory. Zeke used a 3 1/16 by 4 1/4-in. eight-cylinder Studebaker engine. All the others were Millers or Offenhausers, the difference being essentially in name only, since Offenhauser is now operating the old Miller factory.

The most spectacular piece of trouble occurred when the front axle of Al Miller's Boyle Products Special cracked at the left spring pad as Miller was coming down the straightaway on his 118th lap. The car struck the inner wall and then slid back on the track again. Miller received a broken hip, while his riding mechanic was uninjured. At the time of the accident, Miller was well up with the leaders.

In all, four cars were eliminated as the result of clutch trouble. Bill Cumming's clutch failed as the cars were just starting on their warming up lap and his car had to be pushed to the pits. Babe Stapp, in a Pirrung Special, after leading the pack at the 50-mile mark, and running in second place at 100, 150 and 200 miles, was forced to the pits with a broken clutch shaft.

Wilbur Shaw, whom many believed had an excellent chance to win because of a high qualifying speed and exceptionally good gas mileage, ran into trouble when he was leading at 200 miles when the cowl around his engine worked loose. He lost approximately 15 minutes at the pits endeavoring to overcome the trouble.

Turning to the equipment used on the cars, all were fitted with Firestone tires, and with the exception of the Burd Piston Ring jobs all were fitted with Perfect Circle Rings. The upper ring of Perfect Circle manufacture was of unusual construction, as it was wider than it was thick. The lower rings were of the spring-backed type. Bosch Magnetos were universally used on all cars to start the race, and Packard ignition cable was found on all cars except Babe Stapp's Pirrung special, on which Belden cable was used. Winfield carburetors predominated, though Miller, Zenith, Linkert and Stromberg also found favor.

Formal presentation of the new Borg-Warner trophy to the Indianapolis Speedway was made Thursday before the race at a dinner attended by Speed-

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EX-CELL-O

AIRCRAFT & TOOL CORPORATION DETROIT, MICHIGAN

way officials, race drivers and automotive manufacturers. Col. E. V. Rickenbacker, president of the Speedway, introduced the speakers, who included Charles S. Davis, president of the Borg-Warner Corp., and Gov. McNutt of Indiana.

SAE Aircraft Meet

(Continued from page 783)

cently by Ralph R. Teetor, president of the society, during a trip to the Pacific Coast. Among the group of leading aircraft leaders who met with

him were W. B. Goodman, Wright Aeronautical Corp.; Dr. A. L. Klein, California Institute of Technology; H. G. Townsend, Menasco Manufacturing Co.; Hall L. Hibbard, Lockheed Aircraft Co.; Charles F. McReynolds, Menasco Manufacturing Co.; H. D. Houghton, Douglas Aircraft Co.; C. E. Stryker, Curtiss-Wright Technical Institute of Aeronautics; William B. Birren, Wright Aeronautical Corp.; L. W. Olmsted, The Northrop Corp.; Stanley A. Bell, Hughes Aircraft Co.; Foster M. Gruber, Kinner Airplane & Motor Corp., and William B. Stout, Stout Engineering Laboratories. Cooperating with the Society of

Automotive Engineers are the Aeronautical Chamber of Commerce of America and the Air Transport Association of America. The four Pacific Coast Sections of the Society will participate actively in making detailed plans for this meeting. These sections are the Southern California Section in Los Angeles, the Northern California Section in San Francisco, the Oregon Section in Portland, and the Northwest Section in Seattle.

More GM Buildings

(Continued from page 782)

thus completing the foundry program and again pouring at Pontiac all castings required in car manufacture.

The new axle addition will be housed alongside the motor assembly line in a building now standing. No new construction is included in the latest expansion program—the entire appropriation going for new machinery and equipment.

Although it has been less than a year since General Motors purchased the huge plant of the Durant Motor Co. at Lansing and transformed it into the home of the Oldsmobile division of the Fisher Body Corp., the factory is now taxed to capacity and a contract has been let for the construction of two new buildings that will add 80,000 sq. ft. of floor space.

The new Fisher buildings will be one story in height with monitor type roofs and will cost approximately \$200,000. With excavation work under way at the Fisher plant, workmen are enclosing the steel framework of the new three-story engineering building at the Olds Motor Works.

Construction has been started on a new \$100,000 warehouse at the plant of the Motor Wheel Corp. at Lansing, Mich. With manufacturing operations at a new all-time peak the company is forced to provide more room for storage so present space may be used for manufacturing.

At the same time the company announced plans for the addition, a contract was awarded for the razing of seven obsolete buildings of the old Auto Wheel Co. One of them, an old saw mill, was one of the city's landmarks and the original building of the Lansing Spoke Works.

A vast program of centralization has been launched by the Reo Motor Car Co. at Lansing, which will abandon its truck plant at the south limits of Lansing and concentrate its manufacturing operations in the main plant. According to Donald E. Bates, president, the moving operations will be completed within 60 days without causing a halt in manufacturing operations.

The truck plant was built by the Duplex Truck Co. and was purchased by Reo several years ago. It contains 600,000 sq. ft. of floor space. Officials say it will be used for storage purposes.



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Strom

STEEL BALL CO.

1850 So. 54th Avenue, Cicero, Ill.

The largest independent and exclusive Metal Ball Manufacturer

French Railway to Use Budd Designed Trains

Construction of 20 two-car, light-weight, stainless steel, electric trains has been begun in France by the Carel Fouche Co., a licensee of the Edward G. Budd Manufacturing Co., of Philadelphia, and will be completed this year. The trains, being built for the State Railway, will be operated between Paris and Le Mans.

Each of the two-car articulated trains is 40 m. (131.2 ft.) long and weighs complete 50 tons. It is powered by six motors, one on each axle, totaling 1250 hp., the current being supplied by overhead catenary. Maximum speed is 150 km. (93 miles) per hour, and acceleration 2.7 m.p.h. per sec. There is a driving compartment at each end.

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Agreement on Price Bill Likely

(Continued from page 787)

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Advertising allowances are permitted but the Patman-Robinson bill as drawn is intended to prevent their use as a means of price reductions to large buyers that are not given proportionately to all customers of manufacturers.

The legislation, subject of bitter disputes for 10 years or more, with a great deal of the fire centering against large chain and large department stores, is so involved that its provisions were given various interpretations during its discussion in Congress. It is certain that its administration is not going to be so simple as its sponsors indicate. One of the many disputed points pertains to quantity discounts. The Patman-Robinson bill does not prohibit quantity discounts but it is designed, according to its supporters, to prohibit a manufacturer from giving a discount to one customer without giving the same discount to another customer who purchases the same quantity under the same conditions. This interpretation, taken literally, would

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The ability of the F. T. C. to determine quantity limits, if it plans to set them throughout the millions of commercial transactions, is questioned most seriously, even if it had an army of investigators at its beck and call. Supporters of the legislation deny, however, that the bill will require the 1,500,000 retail stores to defend their rights before the F. T. C. Patman said that about the only concern that will be called upon to defend itself before the F. T. C. will be the manufacturer who discriminates in charges among customers for the same quantity and under the same conditions. Proponents

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Good equipment—and
Modern manufacturing methods
Deserve such cutting tools
As will utilize them
To their fullest capacity.

Michigan Tool Company
Believes in furnishing
Always—
The type and kind of
Cutting tools
Resulting in
Lowest production cost
Per piece.

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"Catalog" of
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Michigan Tool maintains
A real staff
Of tool engineers
And
Field representatives
Ready to go anywhere—
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way officials, race drivers and automotive manufacturers. Col. E. V. Rickenbacker, president of the Speedway, introduced the speakers, who included Charles S. Davis, president of the Borg-Warner Corp., and Gov. McNutt of Indiana.

SAE Aircraft Meet

(Continued from page 783)

cently by Ralph R. Teetor, president of the society, during a trip to the Pacific Coast. Among the group of leading aircraft leaders who met with

him were W. B. Goodman, Wright Aeronautical Corp.; Dr. A. L. Klein, California Institute of Technology; H. G. Townsend, Menasco Manufacturing Co.; Hall L. Hibbard, Lockheed Aircraft Co.; Charles F. McReynolds, Menasco Manufacturing Co.; H. D. Houghton, Douglas Aircraft Co.; C. E. Stryker, Curtiss-Wright Technical Institute of Aeronautics; William B. Birren, Wright Aeronautical Corp.; L. W. Olmsted, The Northrop Corp.; Stanley A. Bell, Hughes Aircraft Co.; Foster M. Gruber, Kinner Airplane & Motor Corp., and William B. Stout, Stout Engineering Laboratories.

Cooperating with the Society of

Automotive Engineers are the Aeronautical Chamber of Commerce of America and the Air Transport Association of America. The four Pacific Coast Sections of the Society will participate actively in making detailed plans for this meeting. These sections are the Southern California Section in Los Angeles, the Northern California Section in San Francisco, the Oregon Section in Portland, and the Northwest Section in Seattle.

More GM Buildings

(Continued from page 782)

thus completing the foundry program and again pouring at Pontiac all castings required in car manufacture.

The new axle addition will be housed alongside the motor assembly line in a building now standing. No new construction is included in the latest expansion program—the entire appropriation going for new machinery and equipment.

Although it has been less than a year since General Motors purchased the huge plant of the Durant Motor Co. at Lansing and transformed it into the home of the Oldsmobile division of the Fisher Body Corp., the factory is now taxed to capacity and a contract has been let for the construction of two new buildings that will add 80,000 sq. ft. of floor space.

The new Fisher buildings will be one story in height with monitor type roofs and will cost approximately \$200,000. With excavation work under way at the Fisher plant, workmen are enclosing the steel framework of the new three-story engineering building at the Olds Motor Works.

Construction has been started on a new \$100,000 warehouse at the plant of the Motor Wheel Corp. at Lansing, Mich. With manufacturing operations at a new all-time peak the company is forced to provide more room for storage so present space may be used for manufacturing.

At the same time the company announced plans for the addition, a contract was awarded for the razing of seven obsolete buildings of the old Auto Wheel Co. One of them, an old saw mill, was one of the city's landmarks and the original building of the Lansing Spoke Works.

A vast program of centralization has been launched by the Reo Motor Car Co. at Lansing, which will abandon its truck plant at the south limits of Lansing and concentrate its manufacturing operations in the main plant. According to Donald E. Bates, president, the moving operations will be completed within 60 days without causing a halt in manufacturing operations.

The truck plant was built by the Duplex Truck Co. and was purchased by Reo several years ago. It contains 600,000 sq. ft. of floor space. Officials say it will be used for storage purposes.



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French Railway to Use Budd Designed Trains

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A catalog

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of the legislation also deny that it will increase retail prices.

Permitting quantity discounts, based on differences in cost of manufacture and distribution, the only exception is where a particular commodity is purchased in such great quantities by a very few large buyers that these large buyers, so it was claimed, would obtain a monopoly. The point in mind is exemplified by the action of the F. T. C. in its cease and desist order against the Goodyear Tire Co. in connection with so-called price discrimination in the sale of tires to Sears, Roebuck & Co. Incidentally, the Patman bill carries a new clause by which proceedings

in this case, now in the courts, may be pursued by the F. T. C.

When the quantity limit is fixed by the F.T.C. any purchaser or group of purchasers who buys the quantity limit will receive the same price per quantity unit as the large mass buyers who purchase several such quantity units.

Sales may be made directly from a manufacturer to the retailer or to consumers but if brokerage or wholesale allowances are paid, they must be paid for services actually rendered. The intention is, so supporters of the bill say, to prohibit "bribes" in the form of fees and commissions ordinarily paid to brokers and wholesalers.

Motors Take Big Space At Cleveland Exposition

The automotive building at the Great Lakes Exposition in Cleveland this summer promises, with this week's developments, to be the feature exhibition of the great show.

Ford and General Motors have already contracted for extensive exhibition space and with Chrysler's announcement of space reservations, participation of the three leading companies is assured. Graham, Studebaker, Hudson and Auburn are among the independents that have indicated participation in the show. General Motors' plans include exhibits from the Cleveland plants of Winton Engine and Fisher Body. White Motor Co. has signed for space for an exhibit to be designed by Count Alexis De Sakhnoffsky, who designed most of White's streamlined trucks.

The automotive building now under construction for the Exhibition will be 541 ft. long and 228 ft. wide. It was designed by Antonio Di Nardo and is being built with scissor trusses forming two long gable roof buildings.

General Motors Exported 29,370 Units in April

Sales of General Motors cars and trucks to dealers in the overseas markets during April totaled 29,370 units, and represented an increase of 19.4 per cent over the volume of 24,599 units in April, 1935.

In the first four months of 1936 sales totaled 115,661 units, representing an increase of 23.2 per cent over sales of 93,908 reported for the corresponding period of 1935.

These figures include the products of the corporation's American, Canadian, English, and German factories sold outside of the United States and Canada.

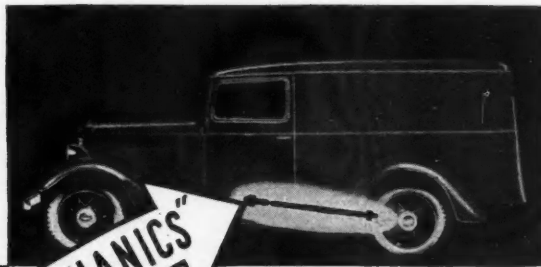


A pamphlet, recently issued by Pratt & Whitney, covering the applications of the No. 3 Universal Bench Miller, was incorrectly mentioned in this column last week as pertaining to a bench grinder. Copies of this pamphlet are available through AUTOMOTIVE INDUSTRIES.

Operating Costs of Light Duty Trucks. A study by the Policyholders Service Bureau of the Metropolitan Life Insurance Co., New York. Available on request to AUTOMOTIVE INDUSTRIES.

A handy 128-page catalog* has recently been announced by Ohio Gear Co., Cleveland. Technical data on gearing, S.A.E. standard heat-treating methods and other useful information is included, as well as a description of the company's line.

Current issue of **The Hydraulic Press**,* periodic publication of the Hydraulic Press Mfg. Co., contains useful information for



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Built as only
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can build

With complete confidence you can specify Mechanics Roller Bearing Universal Joints and Shaft Assemblies as standard equipment. "Built as only 'Mechanics' can build" means more than a quarter-century of experience in the universal joint business—designing, manufacturing, inspecting, testing, servicing products of the highest quality. As a result, Mechanics Roller Bearing Universal Joints are simple, reliable, durable, and economical. All of their parts having any appreciable effect on balance are machined all over. Integral keys, instead of screws or bolts, transmit driving torque. Ample provision is made for easy lubrication. Assembly is simple. Mechanics Roller Bearing Universal Joints are used in leading passenger cars, trucks, and busses for the main drive, in steering gears, for driving air compressors, generators, fans, and for other purposes. Investigate. Write, today, for complete information on Mechanics Universal Joints.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner Corp. 1301 18th AVE., ROCKFORD, ILLINOIS

production men interested in the application of heavy pressures. Performance data on actual installations is given.

Some excellent helps on the technique of brass and bronze welding are contained in an illustrated booklet recently announced by the Linde Air Products Co.

The use of stackers and portable elevators for practically every conceivable purpose is demonstrated in a booklet entitled "A Quick Lesson in Materials Handling," published by Lewis Shepard Co., Watertown, Mass.

An unusually complete line of modern equipment for the production of uniform and quiet gears is described in a pamphlet recently distributed by the National Broach & Machine Co., Detroit.

Illustrating the very latest equipment and practice in the field, Pratt & Whitney's new catalog of Cutter and Tracer Points for Keller Machines* is both informative and complete.

A newly designed "Tire Calculator"* and a "Practical Guide for Tire Combinations on 1½-ton and Larger Trucks"* are recent publications of the B. F. Goodrich Co. and provide a simple and accurate means of foretelling tire requirements.

A series of circulars* have recently been received from the Waterbury-Parrel Foundry & Machine Co., Waterbury, Conn., illustrating the company's full line of bolt and nut production machines including rolling mills, headers, slitting machines, etc.

* Available through AUTOMOTIVE INDUSTRIES.

Reo Streamlines Trucks

(Continued from page 787)

semi-trailer or full trailer.

Three models are offered in the 4-6 ton class. These have wheelbases ranging from 156 in. to 190 in. and gross capacity ratings ranging from 22,000 lb. to 40,000 lb.

The power plant is of the heavy-duty type, 428 cu. in., six-cylinder, seven bearing type. Maximum torque is 284 ft.-lb. at 800 to 1000 r.p.m. The cylinder block is chrome nickel alloy iron with a 4¾-in. bore, 4¾-in. stroke and 428 cu. in. piston displacement. Maximum h.p. is 104 at 2600 r.p.m.

The balanced, fully machined crankshaft has seven large bearings three inches in diameter with a total bearing area of 108.4 sq. in. A five-speed overdrive type transmission provides a wide range of power and speed.

Motor Ads in Newspapers

Up 4.6% in April Over '35

Automotive advertising in newspapers began to rise in March after two very sluggish months and in April continued its gains, climbing 4.6 per cent over April, 1935, according to the compilation of Media Records, Inc., as reported by *Editor and Publisher*.

Lineage of newspaper advertising placed by automotive companies last April amounted to 7,813,168, against 7,466,615 in April, 1935, and 5,453,212 in March of this year.

Bus Output One-Third Higher Than Last Year

Production of buses to date forecasts a higher twelve month output than last year's record of 15,675 vehicles, according to the Motor Truck Committee of the Automobile Manufacturers Association.

The association's figures indicate that 1936 production of its members up to this time is running 33 per cent higher than the equivalent period for 1935 when the number of school buses manufactured was double any previous twelve-month peak and vehicles made for common carriers exceeded every year since 1926.

Canadian April Sales

Up 14% Over Year Ago

New motor vehicle sales in Canada for April reached a new high since 1932. There were 20,658 vehicles sold, worth \$20,898,997, a gain of 2491, or

13.7 per cent over the 18,167 sold in April, 1935, and an increase in value of 16.3 per cent over the total sales of \$17,965,153 of that month.

As compared with March, 1936, there was an increase of 9058, or 78 per cent. Sales for the year to date amount to 43,214, valued at \$44,077,732, compared with 26,967 valued at \$27,524,418 for the first four months of last year.

New passenger car sales for April numbered 17,264 units, valued at \$17,623,238 and truck and bus sales were 3394, valued at \$3,275,759. The four month total for new passenger cars was 35,744, a gain of 2264 over a year ago.

DERMA-SAN

D I S I N F E C T A N T



OIL DERMATITIS often starts like this . .

- FINE metal chips, dropping into cutting lubricant, are often carried by the oil to the worker's skin. Wiping the hands and arms with waste, rubs the chips into the skin, leaves little cuts, through which enter Oil Dermatitis germs. By adding 1 pint of Derma-San to 35 gallons of cutting lubricant you kill pus-forming germs . . . sterilize the oil before it splashes on the skin. Give your men real security against Oil Dermatitis. Order a drum of Derma-San today.

Derma-San is ideal for all general plant sanitation

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PACEMAKER FOR PRODUCTION

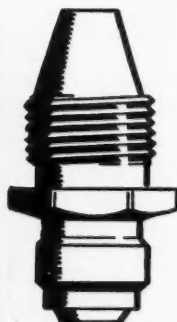
HERE'S THE RECORD

PRODUCTION ON OLD MACHINES

PRODUCTION ON NATIONAL ACME MACHINES

Extra Savings

Three secondary operations eliminated on new machines
Maintenance costs slashed



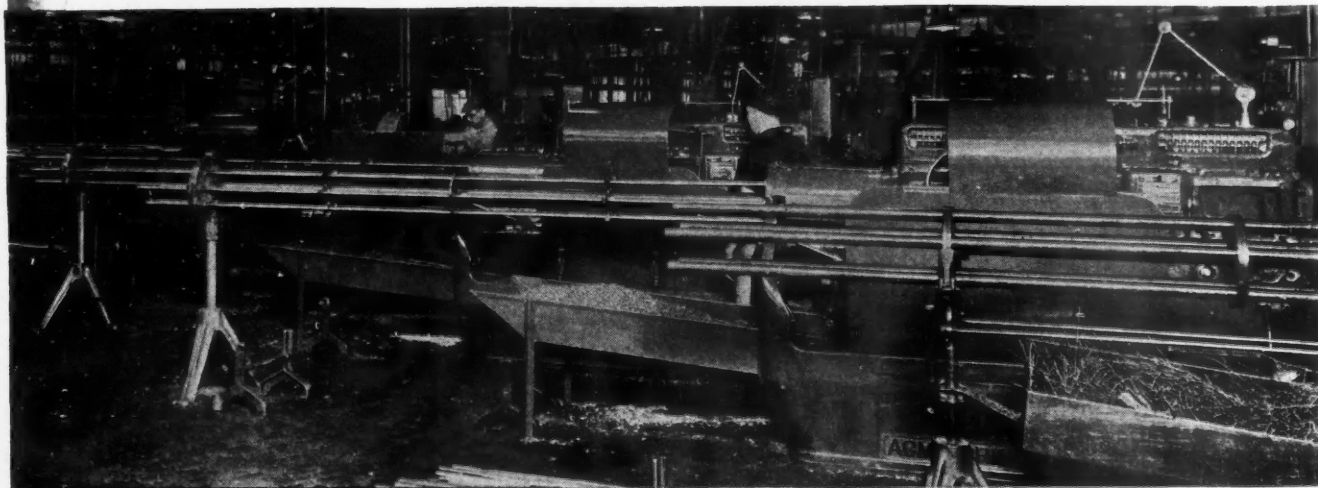
PRODUCTION ON OLD MACHINES

PRODUCTION ON NATIONAL ACME MACHINES

Extra Savings

Down time reduced $\frac{1}{3}$ with new machines
Work is held to closer limits
Maintenance costs materially reduced

$\frac{7}{8}$ " Model R 4-Spindle Acme Gridley Automatics in use in this plant



Automatic Screw
Machines
Dies and Taps
Positive Centrifuges
The Chronolog
Contract Manufacturing

NATIONAL